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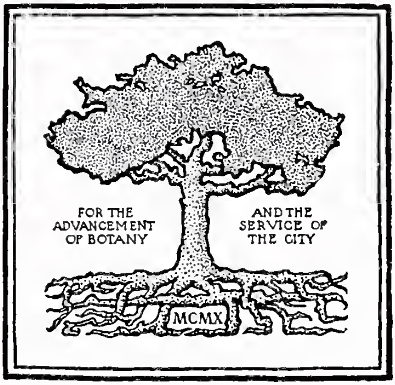
BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS


FOR THE ADVANCEMENT OF BOTANY
AND THE SERVICE OF THE CITY
MCMX

VOLUME 3, NEW SERIES
1947

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BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Spring, 1947

Planting a Slope

—

Hybridizing Plants

—

Rhododendrons, Azaleas,
Blueberries,
and other Heaths

—

Propagating Arbutus

. 3 NEW SERIES NO. 1

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PLANTS & GARDENS

Louis Buhle phot

Spring Adonis (*Adonis vernalis*)

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JOHN C. WISTER, *Editor*

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SPRING DREAMS

A photograph taken in the Botanic Garden by Al Lambert of *The Brooklyn Eagle*

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Spring, 1947

Friends of PLANTS & GARDENS:

All of us here at the Garden welcome another Spring. In temperate climates over the world almost everyone gets renewed pleasure from living when the mellowing winds and warm rains give plant life the signal to grow. The urge to grow! New life, renewed landscapes, hope anew for the better world that is talked about.

PLANTS & GARDENS' way of celebrating Spring is to bring you a roundup of a rather special family of plants. But first, a few statistics: There are hundreds of plant families, some large, some small, and about two hundred thousand different kinds of flowering plants belong to one or another of them. Only about three thousand of this multitude are "cultivated" trees and shrubs. How many of these do you know?

Among the most popular ornamental plants are rhododendron and azalea; and the group to which they belong -- the Heath Family -- is the subject of this issue.

Many heaths and heath relatives are plants of great beauty. Plant hunters have combed the earth for the best of them and hybridizers have produced new varieties by the score. Generally lovers of acid soil, conditions for their growth can be established almost anywhere (see page 26).

One of the curious plants in the group is Indian pipe (page 33); and blueberry is probably the most versatile -- attractive flowers in the spring, delicious fruits in the summer, and exquisite foliage color in the autumn. The few simple characteristics which hold these plants together are explained in word and picture on pages 14 and 15.

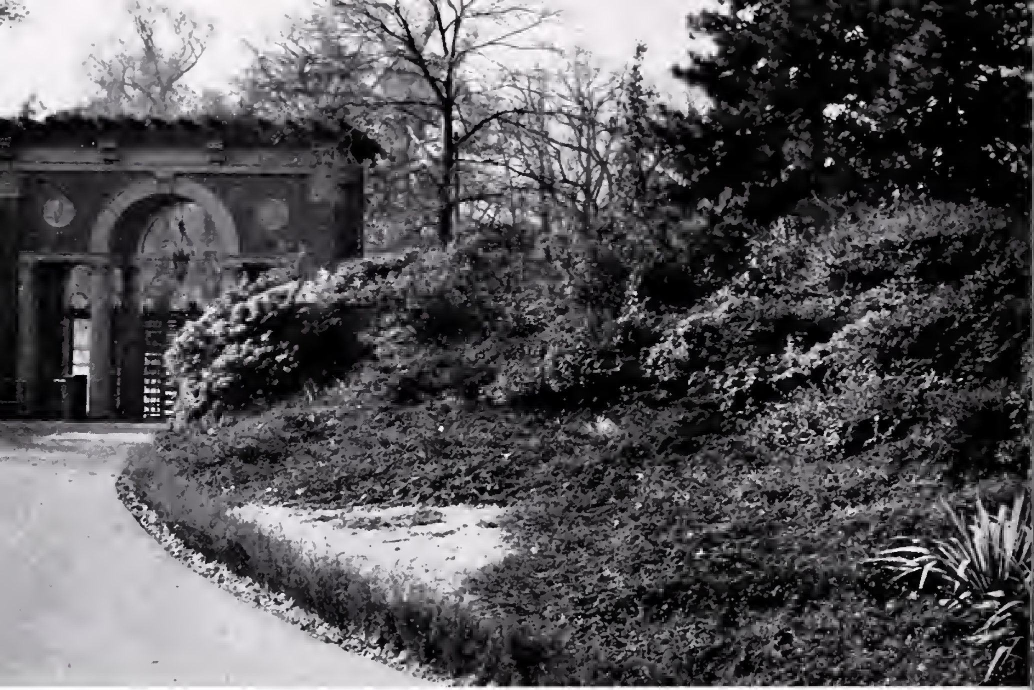
We hope you will make some interesting discoveries in this number!

The April 16th Eastern Regional Conference on Control of Plants Harmful and Annoying to Man was received with enthusiasm by those interested in starting a nation-wide movement to control poison ivy and ragweed. The Conference Report is available for the asking.

Spring Greetings!

George S. Avery, Jr.

Director



Louis Buhle photo

A planting designed by the late Harold A. Caparn, Consulting Landscape Architect at the Brooklyn Botanic Garden

PLANTING PLAN FOR A SLOPE

Adaptable to a home garden

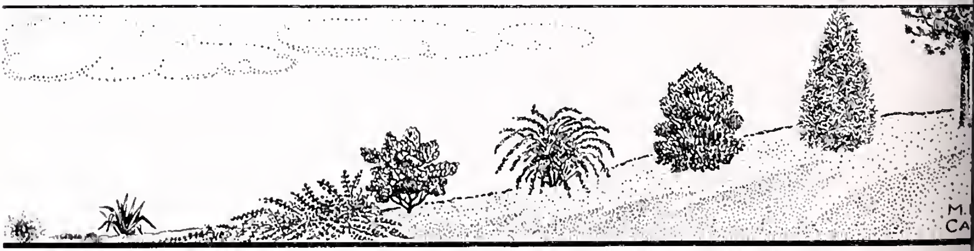
John C. Wister

THE shrub border near the south gate of the Brooklyn Botanic Garden is an excellent example of the attractive planting possible on a gentle slope above a road, path, or lawn. The photographs show how well the various plants blend together, and how attractive they are even in winter, when covered with snow.

Background of Trees

The appearance of a steeper hill is given by the Austrian pines, which serve

Elevation of slope



both as a background and as a frame. Both the Austrian pine and the Scotch are useful for such purposes, are quick-growing, and stand almost any conditions as well as any conifer. For suburban and country places they should be considered as temporary trees, while better ones, like white pine, red pine, or hemlock are growing up. South of Philadelphia the Himalayan pine could well be added to this group; while on the New England coast or in Minnesota the white and red spruces could be effectively used.

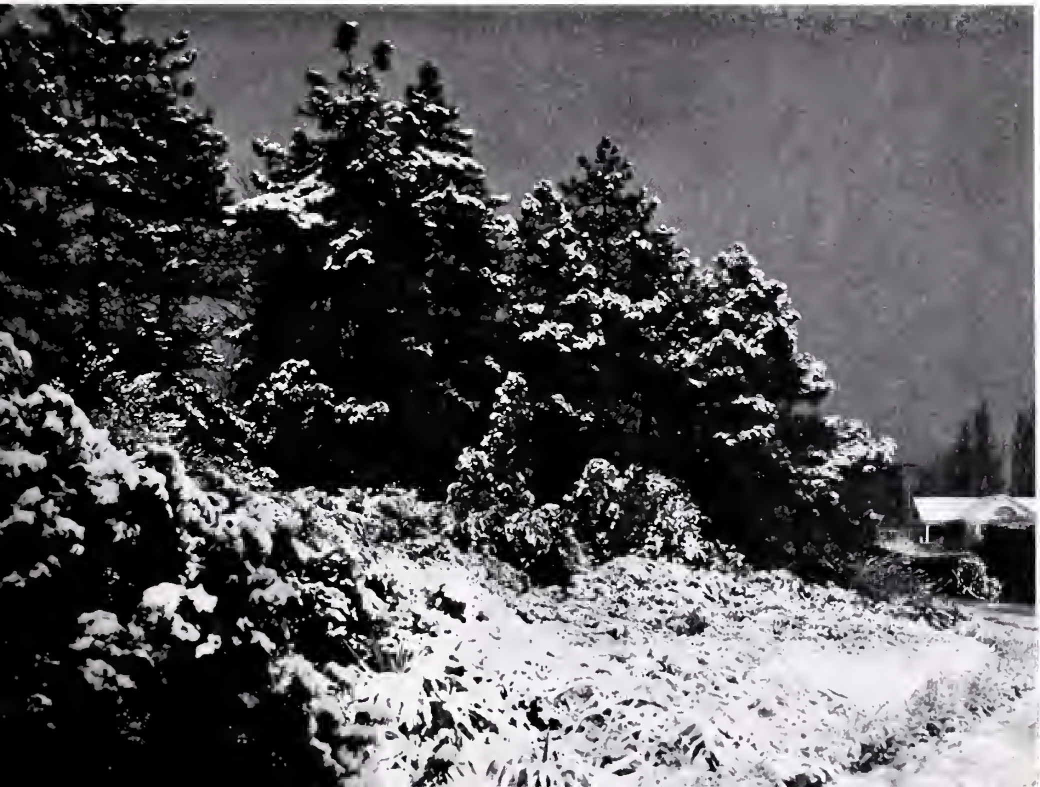
The plan shows a number of specimens of arbor-vitae, which are not easy to pick out in the photograph. There are many forms of the American arbor-vitae which can be used in such a background screen of evergreens, as can the so-called red cedar (*Juniperus virginiana*) and its varieties. Along the coast the American holly would be a useful addition to such a planting, but it will not succeed too far inland or in exposed situations.

There are no deciduous trees in the planting. They were perhaps not necessary in this particular planting, as there are plenty of them near-by. On a small place having no other deciduous trees, some of this type should certainly be included among the evergreens. Our flowering dogwood is perhaps the best for a planting of this size, but sour-wood could also be used; and, on a slightly larger area, silver-bell (*Halesia*) and magnolias could be included.

Shrubs

With this background the shrub planting is extremely effective. The Japanese holly is well used at the back. It is a most valuable evergreen for city use. For cold climates, from Philadelphia north, the small-leaved form (*Ilex cre-*

Louis Buhle photo



Louis Buhle photo

Flowering branch of sour-wood

nata var. *microphylla*) should always be specified. Where tall-growing plants are not wanted, the varieties *convexa, Helleri*, and *nummularia* are particularly useful.

Further forward are two groups of the Kurume azalea Amoena (introduced from China by the Royal Horticultural Society explorer Robert Fortune in 1844, and later reintroduced by Veitch from Japan). The magenta color of this variety is exceedingly effective against an evergreen background and surrounded by evergreens. Otherwise, it is a very difficult color to use and will clash terribly with pinks or reds.

Snow azalea is one of the most useful and most beautiful of azaleas. It is hardy on Long Island; and I have seen it in New Haven, but would not trust it much farther east or north.

Planted nearer the path is the Japanese Pieris, one of the most interesting broad-leaved evergreens that can be grown in the Middle States. It is much more showy than our native (southern) Pieris, and it transplants more successfully. It is one of the earliest shrubs to bloom, the hanging white flowers coming in early April or, in some years, in March.

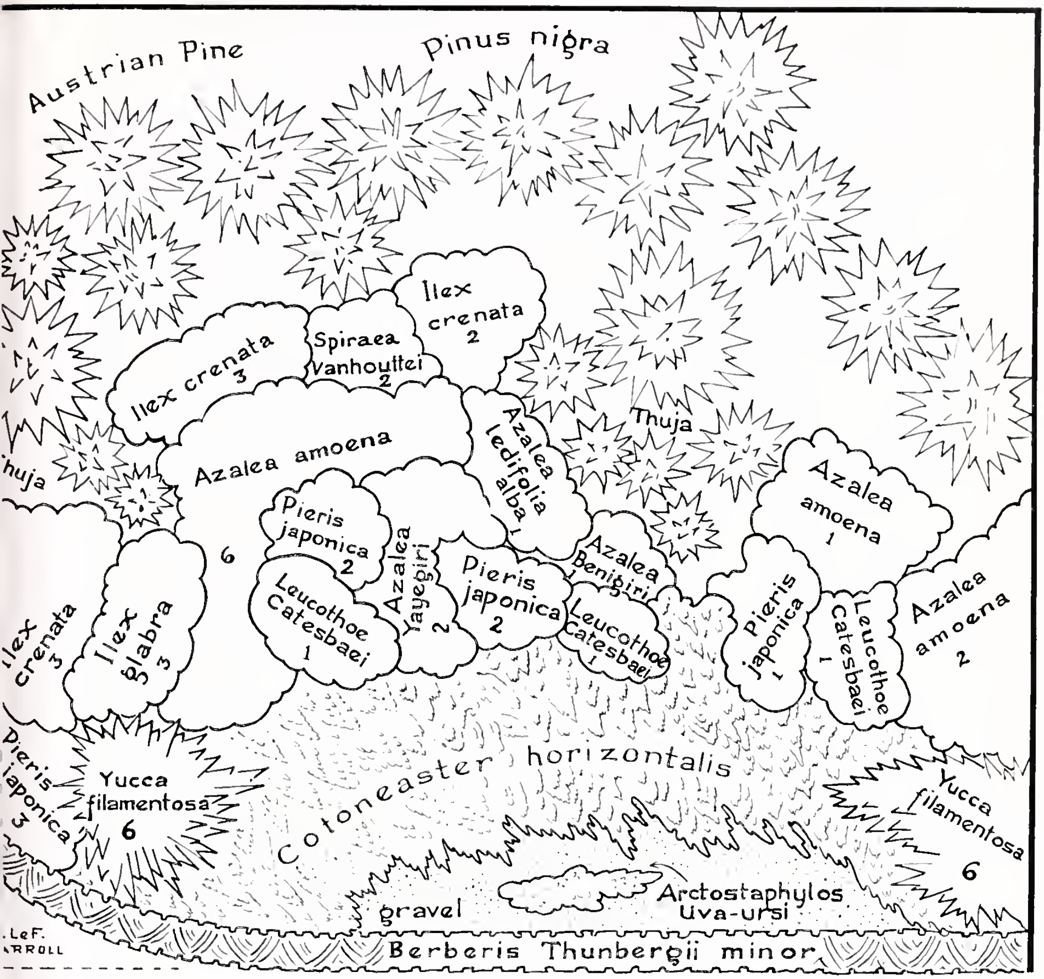
Our native inkberry is a useful shrub, though not at all spectacular. It harmonizes well with the other shrubs in this planting. The drooping leucothoe is perhaps the most graceful of all broad-leaved evergreens; and it is certainly the most useful for bringing a planting down to the ground in the foreground. It fits in well with all rhododendrons and azaleas.

It is seldom that we see yuccas blended so well with a general planting. They are hard to use, with their spiky growth; but here they seem to fit in perfectly.

Rock spray, on the other hand, fits in easily in the foreground of any planting, and always seems to harmonize with the other material. The photographs show how happily it has been used here; but they do not show its great autumn beauty when it is covered with berries. As the berries are liked by birds, they do not remain long for our pleasure. Finally, at the very front, there is the little-used bearberry, a small trailing shrub with shining evergreen leaves; one of our choicest natives, which should be much better known and more used in gardens, wherever a light sandy soil is available.

The only deciduous flowering shrub used is spirea, which lights up the deeper greens.

This planting is simple, inexpensive, and long-lasting, with a minimum amount of care needed. Similar plantings could be made on many small suburban places. One or two Japanese barberries could be used for early spring green and for autumn color; or our native black-alder (*Ilex verticillata*) might be added, or a blueberry or two. Gardeners will think of many more plants which would fit into this general scheme; but if the essential simplicity (which is the cardinal point in this planting) is to be retained, too many kinds should not be used. The good gardener always needs to resist the impulse to add "just one more" favorite. Simplicity should always be the keynote.



Planting plan

Bearberry in sandy soil at foot of slope

Louis Buhle phot

COMMON AND SCIENTIFIC NAMES OF PLANTS MENTIONED IN THIS ARTICLE

Adams-needle—*Yucca filamentosa*
Arbor-vitae—*Thuja occidentalis*
Azalea
  Kurume azalea—*Rhododendron obtusum*
    Amoena—var. *amoenum*
    Benigiri—
    Yayegiri—
  Snow azalea—*Rhododendron mucronatum* (*Azalea ledifolia* var. *alba*)
Barberry, dwarf Japanese—*Berberis Thunbergii* var. *minor*
Bearberry—*Arctostaphylos Uva-ursi*
Black-alder—*Ilex verticillata*
Blueberry (highbush)—*Vaccinium corymbosum*
Dogwood, flowering—*Cornus florida*
Hemlock—*Tsuga*
    canadensis
    caroliniana
Holly—*Ilex*
  American —*opaca*
  Japanese—*crenata*
    Small-leaved—var. *microphylla*
    Low-growing—var. *convexa*
      var. *Helleri*
      var. *nummularia*
Inkberry—*Ilex glabra*
Leucothoe, drooping—*Leucothoe Catesbaei*
Pieris—*Pieris*
  Japanese—*japonica*
  Native—*floribunda*
Pine—*Pinus*
  Austrian—*nigra*
  Himalayan—*excelsa* or *Griffithii*
  Red—*resinosa*
  Scotch—*sylvestris*
  White—*Strobus*
Red cedar—*Juniperus virginiana*
Rock spray—*Cotoneaster horizontalis*
Silver-bell—*Halesia*
Sour-wood—*Oxydendrum arboreum*
Spirea—*Spiraea Vanhouttei*
Spruce—*Picea*
  Red—*rubens*
  White—*glauca*

Bearberry in flower

McFarland photo

HOW TO HYBRIDIZE PLANTS

Explanation of the method, for amateurs, and suggestions of plants to use

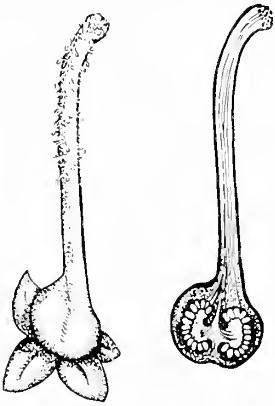
Elizabeth Marcy

MORE than 200 years have gone by since the first hybrid was created. It was a combination of carnation and sweet william, and was reported in 1717. The carnation and the rose were the flowers which allured the earliest hybridizers; the fascination of the latter still endures, and more than 15,000 varieties of roses have been brought into existence. The tulip was the next flower to inspire the breeders. Dumas found the long struggle for "La Tulipe Noire" so captivating that he made it the subject of the celebrated novel to which it gave the name. The black tulip is now a reality, along with 8,000 other varieties. Our grandmothers' gardens would look puny and dull indeed in comparison with ours, so greatly have the breeders multiplied and transformed the flowers which Nature provided. The progress has been quiet but continuous, and amateurs have assisted it greatly. One hundred years of study and research have deepened and enlarged our understanding of the laws of inheritance, and the art of hybridizing has been built into the science of genetics. One might infer that there is no longer any place for the amateur, but this is not true. With only a modicum of knowledge, the amateur can still produce novel, interesting, and sometimes valuable hybrid plants without knowing how Nature maneuvers to achieve the miracles for which he provides the conditions.

How Plants Reproduce

To go about the making of hybrids we need to be familiar with the way in which plants reproduce. The flowers of a plant serve the purpose of giving rise to a new generation of that particular kind of plant. The petals of most flowers enclose *pollen sacs* (mounted on stalks). These are arranged around a central organ called the *pistil*. The pistil has an enlarged base containing one or more small bodies (*ovules*) which will later become seeds. If we open one of these ovules and look at it under the microscope we find that it contains a tiny *egg cell*. A grain of pollen falls on the tip of the pistil and generates a long microscopic tube which grows within the pistil down to an ovule and releases into it a *sperm cell* which fertilizes the egg cell. The ovule then grows in size and becomes a seed, enclosed in the enlarged base of the pistil, which grows and ripens into a dry seed pod, or some kind of fleshy seed container, depending on the kind of plant. The petals, of course, have fallen long before. When a seed is sown the new plant that comes up has developed from the fertilized egg. The characteristics of this new plant are influenced by the pollen parent and the seed parent equally, and so it is important to know where the pollen comes from.

Pistil from snapdragon flower; right, slit lengthwise to show many ovules



The hybridizer, therefore, must be very careful to control the pollen that shall reach the flower. If the pollen is from the same plant, or one identically like it, we say that the flower is self-pollinated; if the pollen is from a different kind of plant we say that the flower is cross-pollinated. Here I might pause for a moment to explain what I mean by the same and different kinds of plants. It would be better, in fact, to use the terminology of botany. The botanist gives the plant two names, a genus name and a species name. The Johnny-jump-ups and the violas both belong to the genus "Viola," but they have different species names: the first is *Viola tricolor*, and the second, *Viola cornuta*. Even within a species there may be conspicuous differences; and so the horticulturist usually divides the species into varieties. Thus *Viola cornuta* Jersey Gem is a purple viola, while *Viola cornuta* Yellow Gold is a yellow one. The closeness of relationship between plants is indicated by this naming scheme. Thus Yellow Gold is a very close relative of Jersey Gem, but more distantly related to Johnny-jump-up which belongs to a different species. Between a violet and a rose there is a still wider gap because the rose belongs not only to a different genus, but also to a different family. Varieties of the same species can almost always be hybridized, different species within the same genus frequently, and different genera only rarely. A cross between a radish and a turnip (different genera) has been made, I believe. Hybrids between two species or two genera often fail to produce good seeds. The great majority of hybrid plants listed in the seed catalogs, therefore, are crosses, not between two species, but between varieties of the same species. These varieties may show many contrasts in color, height, doubleness, or time of blooming; and in making crosses between them one is almost sure of successful results.

Equipment

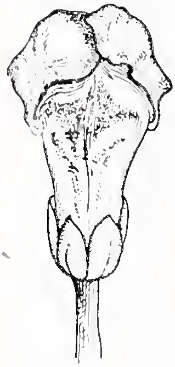
You will need some simple equipment for your experiments in crossing. Most important are paper bags just large enough to fit over the flower nicely without crowding it. Waxed paper bags are best, for they let the light through; sandwich bags are fine if of the right size; or bags can easily be made by gently heating the edges of appropriately sized pieces of waxed paper, folding them over, and pressing them firmly together. To tie the bags you will need a ball of soft string. The rest of your tools include scissors, tags for labeling, and a pair of forceps or tweezers with fine sharp points. The forceps and your fingers should be sterilized before working with each flower, and so you must add a small bottle of 95 per cent alcohol, or any other good disinfectant. All this you should put into a box or basket which you can easily carry from plant to plant.

Method

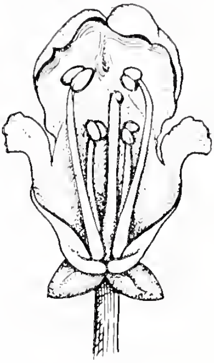
Now you are ready to begin; and, for the sake of illustration, let us say that you would like to cross a purple-flowered plant with a white one. You look first for buds which are due to open the following day. Choose one of these buds, we will assume the white one, open it carefully with your fingers, and with the forceps snip out all the pollen sacs. The pollen sacs presumably have not opened, and therefore no pollen has been released. Then allow the flower to close again, place a bag over it and tie this below the flower. This is to be the female parent. You have removed any chance that this flower will be pollinated with its own pollen, and the bag prevents wind or insects from bringing foreign pollen. Do not remove the pollen sacs from the purple flower, for it is the one you are to use for pollen; simply tie a bag over it. When the two flowers open under the bags remove a pollen sac from the purple flower and brush its pollen against the tip of the pistil of the white flower. Put

Getting ready to hybridize

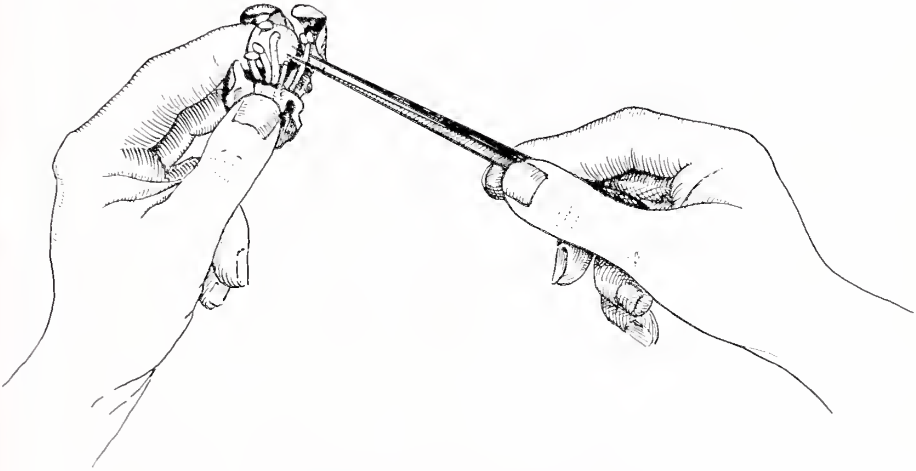
Drawings by Michalena L. Carroll



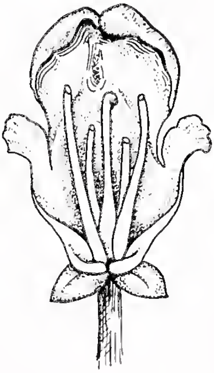
Snapdragon bud unopened



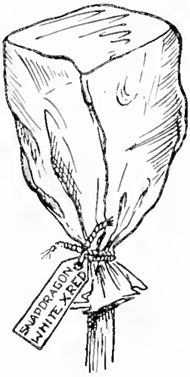
Bud split lengthwise to show pollen sacs and pistil



Removing pollen sacs (a day before the bud opens)



Pollen sacs removed



Flower bagged to prevent cross-pollination on a good deal, for it may take many tubes to reach all of the ovules contained in the pistil of the flower. Again place the bag over the white flower and leave it until the petals are completely withered. Tie a tag just below the flower; and record the cross, putting the female parent first, as: white x purple. Be sure to use a pencil, as ink will run when it rains. The forceps and your fingers should be dipped into the disinfectant.

The seeds which develop will now produce hybrid plants. Collect the seeds before the pods burst and plant them whenever it is feasible to do so. If your parent plants were pure lines, that is, if they both come true from seeds, the various seeds from the cross between them will produce plants quite similar to one another. These are called the *first generation hybrids* (F_1). The flowers of these F_1 plants may be white or they may be purple, but more likely they will be a new color. Sometimes these F_1 hybrids are really surprising. The classic example is a cross made some years ago between two white sweet peas. The resulting F_1 flowers, oddly enough, were purple! This was the stimulus for working out an interesting theory in genetics. A similar phenomenon has been observed in the little flower, portulaca, orange flowers resulting from a cross between two whites. In snapdragons an ivory crossed with a white gives a magenta, and a fine red has been obtained from parents that were yellow and peach in color.

Unusual as the F_1 plants may be, it is well to self-pollinate them and obtain their offspring. The plants from this pollination, called the *second generation plants* or the F_2's, will usually show a wide range of differences often unrevealed in either the parents or the F_1 hybrids. There are two phases, therefore, to the problem of breeding plants. The first phase is to cross-pollinate two plants and obtain an F_1 hybrid. The second is to self-pollinate that hybrid and obtain an F_2 generation of plants. Both phases are important. Crossing brings together in one individual the differing characteristics of two parents. Self-pollinating the hybrid causes these characteristics to separate and recombine in every possible manner, so that all the masked and hidden potentialities of both parents and hybrid come to light.

Some Garden Plants to Cross

Now I suggest a few garden plants which are particularly well suited to be worked on by the amateur hybridizer. Crossing some of the ruffled petunias with each other or with single varieties would be interesting. The double petunia does not usually have pollen sacs but it could be used as a female parent. Morning-glories now come in a variety of colors, and some are double. There is a dwarf blue kind. New colors and other characteristics might be combined with dwarfness. Other annuals that might be worth trying are nasturtiums, phlox, pinks, sweet peas, and some of the annual poppies. Schizanthus and penstemons, with their delicate mixtures of colors, may appeal to some. Snapdragons are especially good because of their great color range. Also the F_1 plants are apt to exhibit "hybrid vigor," a tendency among hybrids to be taller and stronger, and to produce larger flowers than their parents. Many of the "improved types" listed in the nursery catalogs are hybrids with this special vigor. Among the perennials, the columbines seem to me to have all sorts of characteristics which would be interesting to experiment with: size of flowers, length of spur, and, of course, color variations in endless possibilities. Seeds planted in August will give flowers the following year. Other perennials on my list are lupine, foxglove, and hollyhock. If you prefer to tackle some plant that the nurseryman has not already had a hand in improving try the cup-and-saucer vine, *Cobaea scandens*. There is a purple-flowered variety, and also a white one, neither of them very striking but with good-sized and well-shaped flowers.

You will note that the flowers I have

mentioned are all fairly large and easily handled. Many flowers are extremely small, or are arranged in compact little clusters, or have so many stamens that it is very difficult to perform the operation of crossing. Let your patience be your guide with regard to these plants. Daisies and all flowers resembling them are actually clusters of tiny blossoms placed very close together. It would be almost impossible to pollinate each one separately. Also it is rather tedious to hybridize plants which are usually propagated by bulbs or rhizomes, such as tulip, lily, or iris, for it will be several years before the new plants grown from seeds will be large enough to flower. Also many of these germinate slowly and poorly. Unless you are very enthusiastic and extremely patient, leave these plants for the professional.

Some Wild Flowers to Cross

The American wild flowers appeal to me as a most fertile subject for the plant breeder. The possibilities in their development have been only touched upon. A few people have already embarked on this enterprise. The California poppy, so prevalent as to be almost a weed all up and down the California coast, now is available in ruffled and double forms. It seems that we might do more with our native buttercups. A buttercup from Asia, *Ranunculus asiaticus*, is a favorite garden flower of California. This latter has been developed for many years and comes in all colors except blue, and in doubles as well as singles. Crossing this with some of our eastern buttercups might be worth the attempt.

I have always been enthralled by the brilliant, fleeting patches of the butterfly-weed, *Asclepias tuberosa*, blooming in sandy places along railroad tracks in August, and I have long wondered why we do not use it more often in our gardens. The ordinary milkweed has its good points, too; and in the hands of the hybridizer who can tell what it might become? Asa Gray lists 18 species of Asclepias. One of these, the swamp milkweed (*Asclepias incarnata*), has almost scarlet flowers; a desert species, *Asclepias subulata*, has stems over 6 feet tall. If interspecific crosses can be induced to take, what a wealth of opportunity there is! *

Less conspicuous among our native flowers but one which might have promise is the dogbane, *Apocynum androsaemifolium*. It is somewhat poisonous, whence its name, but its flower has good shape and color; and its family has some distinguished members, the oleander and the periwinkle. Here it would be necessary to select wild plants which showed some interesting variations from the type, for a beginning in hybridizing. The twinflower, *Linnaea borealis*, is also a beauty in miniature; and it might be possible to select some variations of it worth developing beyond their modest station.

The art of selection, in fact, goes hand in hand with that of hybridization. In the development of the large blueberries now on the market, selection of the best plants from those growing in the woods and fields played a tremendously important part. Bushes were collected which produced the largest and best berries; these, when brought under cultivation, proved noteworthy in themselves, and of course were the most desirable material to use as parents of hybrids.** So be on the watch for unusual specimens of wild plants and try bringing them into your garden; if they thrive you have fine material for a breeding project.

I have barely touched on a very large subject. Each year we learn more about how to manage the *genes* which control heredity. It is probably just as well that we shall never be able to make plants to order, but it is a great satisfaction occasionally to achieve some small expectations.

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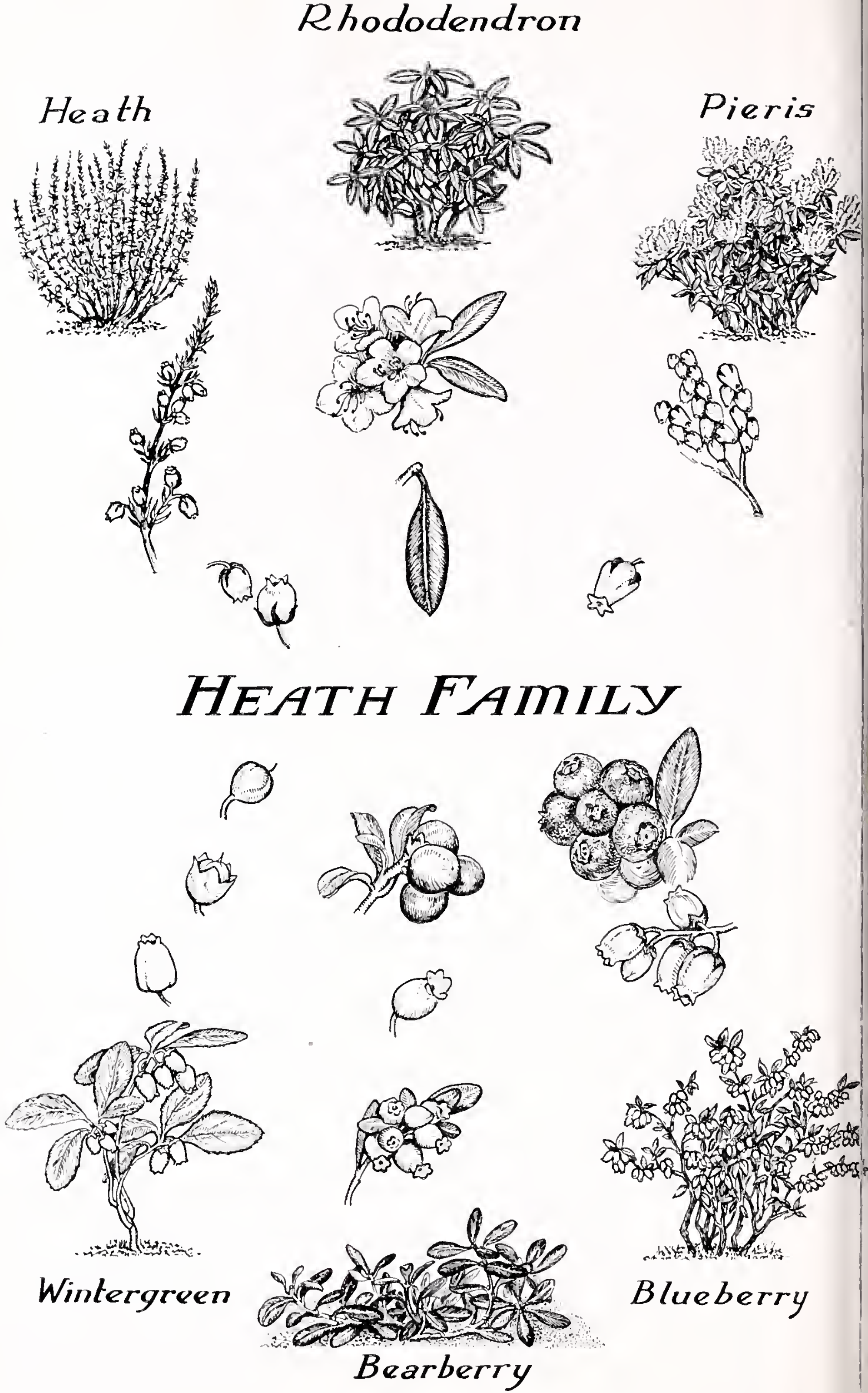
* The amateur would need a little help in finding the pollen sacs and the proper place to deposit the pollen in crossing. Ed.

** See article on cultivated blueberries, p. 41.

HEATH FAMILY



Drawings by Michalena

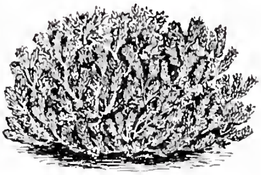
"ODD" MEMBERS OF THE HEATH FAMILY AND CLOSE RELATIVES

Indian Pipe

Shinleaf

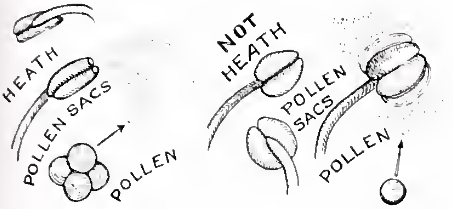
(a large shrub)
Sweet Pepperbush

Pyxie
(Low mat)


Broom Crowberry
1+ to 2 Feet

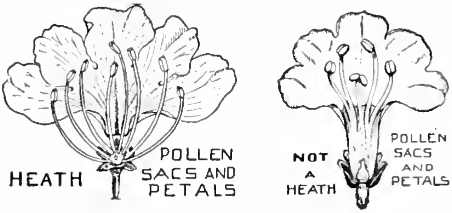
Drawings by Michalena L. Carroll

The many kinds of plants in the heath family (about fifteen hundred) differ greatly in their characteristics. The drawings (on the opposite page and above) show a few of the various forms.



These different types of plants are held together as a family by a combination of features most of which are not noticed by the average gardener: 1. The pollen sacs open by pores at the tip, rather than by lengthwise slits as in most other families. 2. Each particle of the powder-like pollen is composed of four pollen grains joined together (this can be seen only under a magnifying glass). 3. The stalks on which the pollen sacs are mounted do not grow upon the petals as they do in many other families (particularly when the petals are grown together at their edges as they are in most members of the heath family). 4. The number of compartments in the seed capsule or in the berry is the same as the number of petals (or greater), rather than fewer as in most other plant families.

The various members of the heath family are not entirely uniform even in these characteristics. Because of certain exceptions, some plant classifiers split the family into three or four families; removing shinleaf, Indian pipe, and blueberry, for example, into separate families. But Dr. Alfred Gundersen, Curator Emeritus of the Brooklyn Botanic Garden, who has spent many years studying plant families and their relationships, classifies all of these three controversial groups as proper members of the heath family, in his forthcoming book on plant families.



Pyxie, broom crowberry, and sweet pepperbush, also illustrated above, are very closely related to the heath family. They are distinguished from it mainly by technical features which are not easily seen; and they are generally thought of in connection with the somewhat heterogeneous heath group.

PLANTS OF THE HEATH FAMILY FOR SUBURBAN GARDENS

Offering beauty and variety around the year

Harry Wood

THE heath family includes many of the most useful shrubs for suburban gardens, shrubs suitable for both large and small places: plants good for foundation plantings, for large shrub borders, for facing for evergreen windbreaks, and for woodland gardens.

Although these plants all require the same soil conditions, they are so different in form that they combine to make interesting contrasts with each other the whole year through. They vary from large, course, dignified plants such as the rose bay (*Rhododendron maximum*), to finely branched small-leaved dainty dwarf azaleas. Some of them have sturdy evergreen foliage, others are deciduous; among the latter are many that have brilliant autumn color. In time of bloom, they range from the Korean rhododendron (*Rhododendron mucronulatum*) and Japanese Pieris (*Pieris japonica*), which flower with forsythia, to the sorrel-tree (*Oxydendrum arboreum*), which blossoms in July and August. The flowers have a wide range of color: from white, through cream and yellow, to pink, rose, and orange, and to lavenders, brilliant reds, magentas, and deep red-purples. The flowers may be flaring or trumpet-shaped, urn-shaped or like drooping bells: and several inches long or very small. They may be in short broad clusters, or in wand-like spikes.

Soil

In the wild, the members of the heath family grow under widely varying conditions of moisture and exposure; but those that are best adapted to garden use are more uniform in their demands. They need plenty of moisture, both at the root and on top; but at the same time they should have good drainage, so that the soil does not get soggy and stagnant. The soil should be high in organic matter, and acid in reaction. The fine fibrous roots of these plants are near the surface and are easily damaged by sun, sudden cold, and dry weather. Deep cultivation is also apt to injure these fine roots. A protective mulch will contribute much to the good health of the plants: it will help to retain moisture, maintain more uniform soil temperatures, and reduce the need of cultivating.

Good soil preparation before planting is always a good practice. No matter how good the soil is, it can usually be improved. But most soils on suburban places need a great deal of improving, especially where any construction has been done. If there is a question about acidity, a test should be made. To increase the acidity, organic matter that is acid in reaction should be dug into the soil; half-rotted oak leaves, pine needles, and peat-moss are good. Aluminum sulfate is often used to increase acidity; but if too much is used it may create a toxic condition. Acid organic matter is preferable because it not only gives organic acids but makes the physical condition of the soil favorable. Partly

McFarland pho

Rose Bay (*Rhododendron maximum*)

rotted cow manure will add fertility. Where the soil is found to be alkaline, it may have to be removed to a depth of 2 feet, and replaced by acid soil rich in organic matter.

If the soil is thoroughly prepared, further fertilization should not be necessary for several years. However, it is wise to add to the mulch every year or so, to keep the roots of the plants protected and to help maintain the supply of organic acids and moisture.

Proper soil preparation should take care of the moisture needs of the plants, except during long periods of drought. At such times plants should be thoroughly watered at frequent intervals. If the autumn is dry, watering is helpful in preventing winter injury.

The principal pest is lacewing fly, which is always worst on plants growing in hot and sunny situations. It can be controlled by spraying with a nicotine sulfate.

Rhododendrons

Among the most commonly grown heaths is the rose bay (*Rhododendron maximum*), which is abundant from New York to Georgia in hilly sections, especially on north or shaded slopes. It is hardy as far north as the Canadian border. It is useful in shade, under trees or on the north side of a house, even in deep shade where the growing of other plants is difficult. Its light pink flowers, produced in early summer, are more abundant if it gets some sun; but it will not thrive if exposed to full sun.

It is not a good choice for the foundation plantings of small houses; but it may sometimes be used successfully in the planting around a large house. Large plantings of this shrub unrelieved by other plants are apt to be heavy and monotonous; and it eventually becomes very massive, or else rather tall and bare at the bottom; for these reasons, it is best

Rhododendrons

Gottscho-Schleisner pho

planted where other shrubs can be used to hide its base and to offset its coarseness. It is at its best in groups, in large mixed plantings under tall trees such as oaks and hickories, where it has room to develop. There the plants blend into a dignified and graceful mass.

The mountain rose bay (*Rhododendron catawbiense*), a native of the southern Appalachians, is not so popular as a garden plant because of its magenta flowers and straggly habit of growth. It needs more sun than the rose bay, and blooms two or three weeks earlier, toward the end of May in the vicinity of New York. It is important as the parent of many hybrids, giving a hardy constitution to plants with flowers of far lovelier colors than its own.

Another rhododendron from the southern mountains is the Carolina rhododendron (*Rhododendron carolinianum*). It is more slender in growth, and has smaller leaves, but it will ultimately reach a height of 8 or 10 feet. Semishade suits it best. In moderate sun it produces a great quantity of bloom in early May. Since it naturally has a wide range of color in the flowers, one can easily choose plants that will give a pleasing effect either in foundation plantings or in shrub borders. Selecting colors is especially important in foundation plantings, where the color of the house must be considered. The lavender-pinks, for example, do not go at all well with brick; but many plants have white or near-white flowers, and there are good clear pinks.

Mountain-laurel

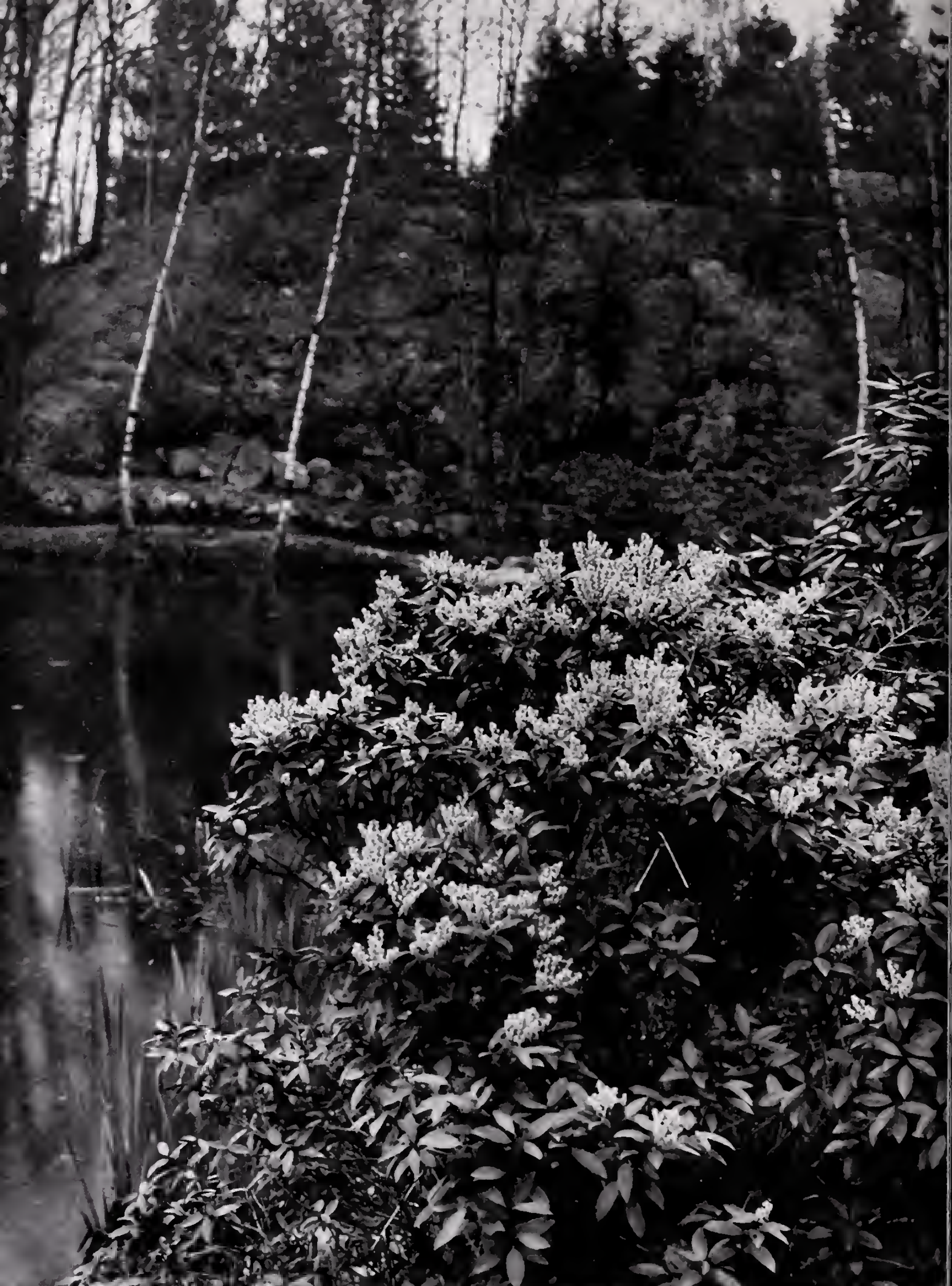
The mountain-laurel (*Kalmia latifolia*), widely known and grown, native through a large part of the eastern States, is one of our most versatile shrubs. It is hardy as far north as parts of Maine and southeast Canada; it will grow in full sun and also in shade; but in deep shade it cannot be relied upon for its exquisite flowers in early June. It is a fine plant for foundation plantings, for shrub borders, and for woodlands. Its smaller leaves make it suitable for small houses. Planted in groups, it develops into lovely billowing masses of green, cheerful even in freezing weather when the leaves of the rhododendrons are curled so tight they are hardly visible. Although it eventually becomes a large shrub, it grows slowly enough to be good for many years in foundation plantings.

Pieris and Leucothoe

There are three evergreen shrubs of the heath family which should be more widely used. These are two kinds of Pieris, and the drooping leucothoe (*Leucothoe Catesbaei*). They all have branching clusters of small, waxy white, urn-shaped flowers.

Pieris is often wrongly called andromeda. The mountain Pieris (*Pieris floribunda*) is from the southern States. It is broader than high, sometimes reaching a height of 6 feet in the wild. Its leaves are smaller than those of mountain-laurel, and a dark, dull green. The flower clusters are erect, and the flowers open about the middle of April. This is a shrub that does not transplant easily. It should always be handled carefully, and should be placed where it will not be crowded and overgrown by other plants. While it needs good drainage, it suffers in droughts. It should have some protective shade. Mountain Pieris is a good choice for slopes, or wherever a low plant of good constant green is wanted.

Much easier to handle and grow is the Japanese Pieris (*Pieris japonica*). It is quicker of growth and more upright in habit than the mountain Pieris. Its leaves, borne in starry whorls, are lustrous green. The young growth, sometimes light green, sometimes coppery or red, is one of its outstanding attractions. The drooping clusters of flower buds are conspicuous all winter, and the flowers are among the first to open in the spring. It will reach a height of 8 or 10 feet,



McFarland pho

Mountain Pieris

but will stand more pruning than most of the large heaths. It transplants easily with a ball of earth; and so if it outgrows one location, it can be moved to another. It stands a considerable amount of sun or shade, but is at its best in light shade. Here, if it has room to develop, it grows into a tall picturesque shrub that looks like a waterfall of white when in bloom.

The small leaves of this plant make it adaptable to shrub borders of any size. It can be planted with rhododendrons, but should be given enough space to develop. Because of its upright habit, it may be used in foundation plantings where accent is wanted. Two fine specimens may be used on each side of a doorway, for example, or three or more may be grouped around a corner. A single large plant may be used in a space between windows, with more spreading plants such as mountain-laurel and leucothoe under the window.

Drooping leucothoe (*Leucothoe Catesbaei*) is a fine evergreen shrub, native to moist banks of streams from Virginia to Georgia. In appearance it is different from Pieris because of its many slender arching branches rising from ground level. The leaves, 3 or 4 inches long, which clothe the branches to the ground, turn to beautiful shades of bronze and purple in winter. These colors give a very pleasing effect with the solid dark green of other evergreens. It is especially attractive when planted on banks or by steps with low plants such as some of the evergreen ferns. In foundation plantings it can be counted on not to grow too tall. Drooping leucothoe is very useful for filling in at the base of large rhododendrons, or wherever a graceful low shrub is needed. It gives a soft and natural appearance to plantings that might otherwise seem rather coarse. Another kind, the coast leucothoe (*Leucothoe axillaris*), is sometimes grown; but it is less attractive and less hardy.

All of these plants are brittle and easily broken by snowslides from roofs. Strong wooden frames can be used to protect the plants if there is no provision on the roof for breaking up heavy avalanches. Or strong stakes can be driven in among the plants. Dark green stakes are inconspicuous, but enough of them must be used to protect the plants thoroughly. The stakes should extend a few inches above the plants, so that they will break and scatter the masses of snow or ice. In places where especially large masses of snow collect, spreading forms of Japanese yew (*Taxus cuspidata*) are more satisfactory.

Azaleas

Azaleas offer unlimited possibilities. All the native azaleas are deciduous and rather upright in habit. A large group native in the eastern States would be used more if they were better known. They give a long season of bloom, from the pink-shell azalea (*Rhododendron Vaseyi*) in April to the swamp azalea (*Rhododendron viscosum*) and the smooth azalea (*Rhododendron arborescens*) in June and July. The pink-shell azalea is a tall straggling shrub with dainty flowers in varying shades of pink, which open before its leaves come out. It has good autumn color; and its chief value is for borders and woodland plantings. The purple azalea, or pinxter-flower (*Rhododendron nudiflorum*), much commoner, is less attractive; the flowers are a duller or paler pink, in early May. Its variety *roseum*, resembling it in habit and form, has fragrant flowers of a better pink.

The flame azalea (*Rhododendron calendulaceum*) is a beautiful native of the Carolina mountains. It blooms later than the pinxter-flower. Some plants have pale yellow flowers; others, pink or deep rose; still others, orange, or a mingling of these colors. Because of their color range, these shrubs must be used with care in plantings where rhododendrons with pink or lavender flowers may be in bloom at the same time. They are excellent for borders and woodland plantings.

Two Asiatic kinds, the royal azalea

McFarland pho

Graceful branches of drooping leucothoe

(*Rhododendron Schlippenbachii*) and the torch azalea (*Rhododendron obtusum* var. *Kaempferi*) are most satisfactory. The royal azalea, from Korea, has large flowers of the same beautiful pink as the pink-shell azalea, and blooms with it. The leaves, larger than other azalea leaves, are in circles, and color well in the fall. This azalea will eventually reach a height of 15 feet.

The torch azalea is more finely twigged, with smaller leaves that tend to be evergreen in the milder part of the range where it can be grown. It blooms, in the vicinity of New York, about the middle of May. The flowers are in light and dark tints of salmon-red. It will grow to 15 feet in high shade. All of these azaleas are hardy northward in New England.

There are many hybrid races of azaleas; among these are the Kurumes, often used promiscuously in foundation plantings, also much used as potted plants; the Ghents, which resemble the flame azalea in form but have a much greater color range; and the Mollis azaleas, with large flowers in shades of yellow to deep orange.

While evergreen shrubs are considered best for foundation plantings, a few deciduous ones can be used, especially if they are placed where there will be green behind them and perhaps under them. Much depends upon the architecture of the house. With a low inconspicuous foundation a fine azalea of upright habit will show to advantage against a wall. Such evergreen Kurume azaleas as Amoena and Hinodegiri, desirable though

Japanese Pieris

McFarland photo

their foliage and habit may be, give a spotty effect when they are in bloom. The snow azalea (*Azalea ledifolia alba* or *Rhododendron mucronatum*) is an excellent companion for the taller royal azalea or torch azalea.

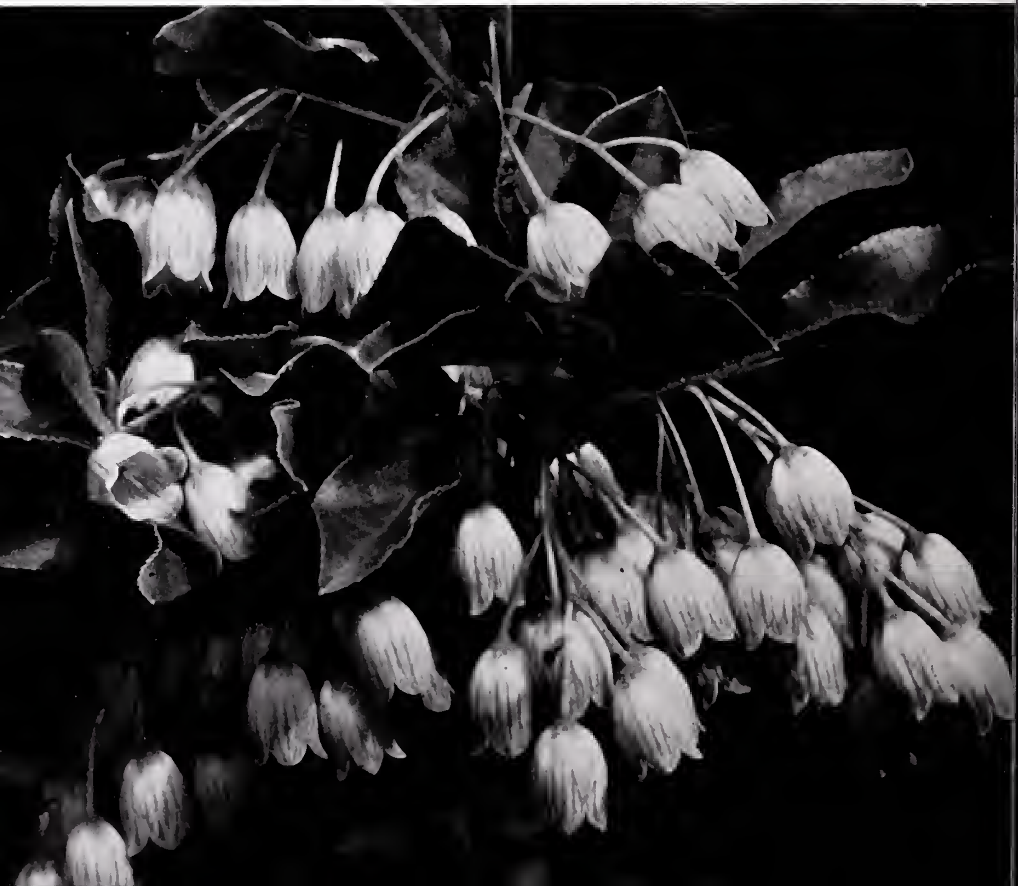
Other Deciduous Heaths

In addition to the evergreen heaths, there are deciduous ones, little known, or little used as ornamental plants. The red-vein Enkianthus (*Enkianthus campanulatus*) is a fine shrub native to Japan. It has clusters of bell-shaped flowers drooping from slender stalks in late May. The flowers vary from creamy white to dull red; the lighter ones have dark veins or a rosy edge. The leaves are 2 or 3 inches long, in circles, and color beautifully in the fall. The bushes are upright in habit, rather narrow, and eventually reach a height of 10 or 15 feet. The rate of growth is rather slow, however. The white Enkianthus (*Enkianthus perulatus*) is a lower kind and is difficult to obtain. Its white urn-shaped flowers open before the leaves. Although the flowers of Enkianthus are not conspicuous, they are charming; and the habit of growth and autumn color of the plants add interest to evergreen plantings.

Another heath, valuable for color contrast, is the familiar highbush blueberry (*Vaccinium corymbosum*). In winter its fine red twigs and conspicuous red buds are effective. In spring, the opening leaves, in shades of soft orange, give a

Flowers and leaves of red-vein Enkianthus

McFarland photo



beautiful effect with the small waxy white drooping flowers. The birds will get the berries before they ripen; but in the fall there will be the interest of brilliant color in the foliage again. Blueberry bushes are often twisted and picturesque in appearance. They are slow-growing; and so, for all practical purposes, they can be considered as having an ultimate height of 6 to 10 feet.

Sorrel-tree, or sour-wood (*Oxydendrum arboreum*), is an attractive tree that reaches a height of 60 feet in the woodlands of the southern Appalachians. Usually we see it as a small narrow tree with a straight slender central trunk. Its great value is in its very brilliant autumn color. The flowers are urn-shaped, pale greenish white, in slender arching clusters at the ends of the branches. The tree is not very conspicuous when it is in bloom, but the whitish seed pods offer a noticeable contrast to the red fall foliage. The sorrel-tree should be used more in plantings with rhododendrons and other heaths, or where a small tree is wanted in light shade.

Luxuriant bloom of red-vein Enkianthus

McFarland photo

Louis Buhle photo

Royal azalea

Good Companions in Other Families

Several plants of other families flourish under the same conditions as the heaths, and combine well with them. Among these the hemlock is the outstanding conifer because of its ability to grow in shade. Flowering dogwood, always lovely, is much used. Interest and variety can be added with the American holly (*Ilex opaca*); the inkberry (*Ilex glabra*), a low shrub with small evergreen leaves that assume purplish tints in winter; and the winterberry (*Ilex verticillata*), with many bright red berries, which are conspicuous after the leaves have fallen, and persist long into the winter.

The summer sweet, or sweet pepperbush (*Clethra alnifolia*), is closely related to the heaths. Its fragrant white spires of bloom are welcome in midsummer. Under garden conditions it is usually about 5 or 6 feet high. The leaves turn yellow in the fall.

Another attractive tree from the southern mountains is the silver-bell (*Halesia carolina*). Even when small it blooms profusely in the spring, the branches strung with showy white bells. It should be planted where it has plenty of room to develop, as it grows rather quickly, and will reach a height of 30 or 40 feet.

The sweet bay (*Magnolia virginiana*) has fragrant white flowers for about a month in the summer; and attractive leaves, silvery beneath, which have a tendency to be evergreen in milder climates. It is suitable for woodland plantings in light shade.

Throughout the middle eastern States all these plants, wherever they are given the proper environment and care, will contribute enormously to the beauty and interest of the suburban place during the whole year.

ACID SOIL FOR HEATHS

Most heaths require an acid soil. In a limestone region it is imperative to make the soil acid before planting any of the heaths. This may be done by digging a pit about 2 feet deep and filling it with soil which has had large quantities of organic matter added. As much as one fourth to one half by volume may be organic matter, and the remainder soil. Peat-moss is useful for this purpose, or partly rotted leaves or pine needles. The addition of a small amount of finely powdered sulfur is desirable. Sulfur is slow to produce acidity, but lasts for a long time. It should be thoroughly worked into the soil. Aluminum sulfate is good, also, especially where quick results are desired. It should be worked into the soil at the rate of one-half to one pound per plant (this assumes a fair-sized shrub) The amount of sulfur or aluminum sulfate to be applied should be based on a soil test; for the more alkaline the soil is, the more materials will be necessary to make it acid. To be sure you are right, send a soil sample to your Experiment Station for analysis and recommendation.

HEATH FAMILY SHRUBS FOR CITY GARDENS

How to choose and care for them

Natalie H. Bowen

SHRUBS of the heath family offer more beauty and usefulness to the city gardener than any other comparable group of plants. Their handsome foliage, evergreen in many kinds, their colorful display of bloom during the spring months, and their neat, slow habit of growth make them fit well into the design for a small city garden which is on view the year around.

The hardiest of these shrubs, rhododendron, azalea, Pieris, kalmia, and leucothoe, all tolerate a considerable amount of shade, have similar soil and moisture requirements, and suffer less from air pollution than most conifers and many deciduous flowering shrubs. If the soil requirements of these plants are met, and if the shrubs are not allowed to suffer from drought or undue exposure to extremes of heat or cold, they can be fairly permanent residents of an urban garden.

Soil

All of these plants thrive on rich acid soil. While most soil in cities along the northeast coast tends to be acid, much of that found in back yards is extremely poor, and far too shallow to be used for any kind of plant without a considerable amount of improvement. Usually it is wise to discard the top inch or so, which has been polluted by deposits of oily soot and dust. The remaining topsoil, if it is of good texture and free of trash and stones, should be put aside while the subsoil is excavated to a depth of about 18 inches. If the topsoil is so poor that it cannot even be used to mix with new soil, it should be discarded along with the subsoil.

For success with plants of the heath family, good drainage is essential. Heavy clay or large rocks at the bottom of the excavation should be replaced by a layer of coarse cinders and sand; too frequently in cities the barren earth from cellar excavations has been used as fill in the yard. On the other hand a more fortunate city gardener, digging in his yard for the first time, may find a deep, porous, sandy subsoil that is just right for his needs.

Topsoil used to fill the planting holes for the shrubs should be carefully prepared if good growing conditions are wanted. Good loam should be mixed with rich acid leaf mold; up to two thirds of the mixture may be leaf mold, or leaf mold and peat-moss combined. Sometimes it is not easy to get leaf mold, but the effort is well worth while. An acceptable mixture can be made of very well rotted manure and peat-moss; but this mixture should be allowed to lie for a season before being used, so that the manure will be completely broken down into compost and well amalgamated with the peat.

Peat-moss is essential as a year-round mulch, to retain moisture at the roots and to protect the shallow-rooted plants against extremes of cold and heat. A mulch of 3 to 5 inches will do those things, and also check weeds and present a neat appearance. If a great deal of soot and dust is deposited on the garden during the winter, the top layer of the mulch should be carefully raked off in the spring, and replaced by fresh peat-moss. The soot will not be evident during the growing season because regular watering will wash it down.

If leaf mold is used in generous quantities at planting time, it is not necessary to add any other fertilizer for the first year, or even two years. After that, unless more leaf mold is added (mixed with the peat-moss mulch), there should be an application, each season, of a complete fertilizer especially compounded for acid-soil plants; the manufacturer's directions should be carefully followed. If the soil is very poor, and leaf mold is not used, some fertilizer should be added at planting time. The valuable peat-moss is definitely *not* a fertilizer as some people mistakenly believe.

Deep Watering and Clean Foliage

When the evils of air pollution are better understood, it will be evident to anyone why all plants—not only shrubs of the heath family—require more care in the city than in more favored locations. Recent studies in New York City have disclosed that air pollution has increased 40 per cent within the past ten years, and that a monthly average of two thirds of a ton of soot descends on one city block in Manhattan. Other cities and other boroughs of Greater New York may not have such a load to bear, but the harmful deposit must still be taken into serious consideration.

Fortunate it is for gardeners that plants of the heath family can thrive under difficult conditions. If their soil and planting requirements are met, and a mulch maintained, the other two factors on which their success depends are deep watering and clean foliage. Deep watering cannot be overemphasized. Unfortunately, it is often neglected because it is not well understood. Even though the plants are shallow-rooted, they need the ever-present moisture that only thorough deep watering provides. For finest appearance, the foliage should be hosed frequently; and it greatly benefits by a soap-and-water treatment early in the spring. A soft brush or sponge can be used, and the foliage hosed with plain water afterwards. A hosing on a warm day in winter is very beneficial, provided it is done early enough to allow the foliage to dry before nightfall.

Design

It is possible, though not always desirable, to design a complete small garden with shrubs of the heath family, and have a lovely picture the year around. Naturally, one would desire a tree or two, flowering or shade; and such trees should be chosen from the viewpoint of their tolerance of acid soil and shade. Where there is sufficient space, a pin oak is an excellent choice. Magnolias thrive in the city, and are tolerant of acid soil. Crab apples in variety, hawthorn, and flowering dogwood will generally do very well if carefully planted and cared for. They will bloom profusely if there is some sunlight, but in dense shade they will have only the beauty of their foliage.

If more variety is desired, other evergreen and deciduous shrubs may be added; and these should have cultural requirements similar to those of the heath family shrubs. Of city-tolerant shrubs that look well combined with rhododendrons, azaleas, and other heath family plants, yew (*Taxus*) and Japanese holly (*Ilex crenata*) are at the top of the list. The Japanese yew (*Taxus cuspidata*) and its form *capitata* seem to be the hardiest. There is a variety of Japanese holly (*Ilex crenata* var. *rotundifolia*), with slightly larger, rounder leaves, and denser growth. For edging, low hedges, and foreground plantings, two other varieties of Japanese holly (*Ilex crenata* var. *Helleri* and *Ilex crenata* var. *microphylla*) cannot be matched. Deciduous shrubs must be carefully chosen not only for similar cultural requirements, but also for appearance, harmony, and general suitability. Many of those that are tolerant of city conditions are not neat enough nor handsome enough to be in the company of azaleas and Pieris. Viburnums in variety are a good choice.

Ground covers can be grown under the shrubs if they are desired. Periwinkle (*Vinca*), pachysandra, and ivy are attractive, and will root rapidly and spread luxuriantly in the moist, porous mulch. Ivy (*Hedera Helix*) will give the densest foliage. If the form *baltica* is used, it will retain its leaves even in very cold winters.

The picture can be completed with a variety of spring-blooming bulbs, shade-tolerant perennials, wild flowers, and ferns. If color is desired in midsummer, callas, fancy-leaved caladiums, fuchsias and begonias may be added—according to one's taste.

Azaleas

Of the four or five members of the heath family suitable for a city garden, the azaleas offer the maximum in tolerance and colorful bloom. Year after year, they greet the new season with a wealth of color. The hardiest ones, the Kurume azaleas, offer a wide choice of colors from white, through shades of pink and rose, to deep crimson. The ever-popular but violently magenta-colored Amoena is a good choice where it can be planted with white or harmonious colors. Hinodegiri, also popular, is listed as scarlet, but is more often a fiery rose red, not too easy to use properly. The snow azalea (*Azalea ledifolia alba* or *Rhododendron mucronatum*), semi-evergreen, is a fine peacemaker between loud colors, as well as a choice white planted by itself. *Azalea poukhanensis* (*Rhododendron yedoense* var. *poukhanense*) is very hardy, and has a graceful low spreading habit of growth, with large, pale bluish lavender flowers very early in the spring. In my own garden it is planted at the edge of the terrace where a deep dry well accumulates a store of water; its steady increase in size and beauty is eloquent evidence of the value of deep watering.

The Mollis azaleas, though deciduous, offer beautiful colors not available in evergreen or semi-evergreen sorts. Shades of yellow, apricot, and orange are available. If these as well as other deciduous azaleas are interplanted with evergreens, more variety of form and color can be achieved. Color catalogues from the better nurseries show fairly true colors, and allow a good choice to be made in ordering. The best method, however, is to see the azaleas in bloom before making the final selection. For lasting satisfaction colors as positive as those of most azaleas should be chosen with great care, particularly on account of the restricted space of a typical city garden.

Rhododendrons and Mountain-laurel

For height, background, and mass, the rose bay (*Rhododendron maximum*) is the best choice. The soft color of its flowers blends well with others. Its legginess can be hidden by planting lower-growing hybrids or the Carolina rhododendron (*Rhododendron carolinianum*) in front of it. Hybrids offer a wide choice of colors; and the Carolina rhododendron has very distinctive foliage and a neat habit of growth. Rhododendrons

Snow azalea

McFarland photo

may not bloom profusely after a few years in the city, but their foliage is so highly decorative that the blossoms are hardly missed.

Mountain-laurel (*Kalmia latifolia*) is a desirable shrub to use with rhododendrons. It is not so permanent in cities, but being comparatively inexpensive, it may be replaced without too much of a blow to the budget. I should like to stress the importance of purchasing nursery-grown rather than collected stock. Because of the price, and the ease with which mountain-laurel and rose bay can be dug from the woods, the majority of dealers offer collected stock. While it is the economical purchase for country gardens, it is poor economy indeed when such collected stock fails to thrive in the city and has to be replaced. In general, plants have to struggle to overcome hostile city conditions. If their roots have been carelessly hacked out and transported with little protection, their chance of survival is small. A nursery-grown shrub, dug with a compact root ball and securely burlapped, is well worth the difference in price.

Pieris

The Japanese Pieris (*Pieris japonica*) is probably the hardiest of the heath group, and one of the handsomest of all shrubs the year around. During near-zero weather, when the leaves of rhododendrons all but curl out of sight, Pieris stands out as the greenest and cheeriest of all broadleaf shrubs in my garden. It is the only one that I have seen succeed on wind- and sun-exposed roofs and terraces. It seems to bloom best in full sun, but it also does well in partial shade. It blooms poorly in complete shade, but retains its interesting foliage variations, pale green new growth against the deep green of the older. If well mulched and watered, Pieris will not become leggy. A little judicious pruning will help to keep it full and bushy. The miserable leggy specimens one so often sees in city gardens have never had good rich leaf mold and devoted watering to help them along.

Mountain-laurel

Elsie M. Kittredge ph

More Difficult Shrubs

The beautiful and graceful leucothoe does not always succeed in city gardens; it apparently needs a sheltered position. Additional winter protection, in the form of salt hay or evergreen branches, and a deep layer of peat-moss around the base are needed to bring it through the winter. When well grown, it is a choice shrub for underplanting and is particularly well suited to small gardens where it can be seen at close range.

Some gardeners may succeed with more difficult members of the family; but the foregoing selections are safe for the busy home gardener with a shady yard and not too much time for fussing over difficult plants. Careful selection, a good design, and regular maintenance care will assure a lasting and handsome garden, and will justify purchasing the best available stock.

CRANBERRIES FOR ORNAMENTAL PLANTING

The low creeping shrubs on which cranberries grow form a dense mat on the ground; these plants have small evergreen leaves and attractive little pink flowers turned almost inside out. Anyone interested in gardening and horticulture, seeing these features for the first time, might wonder why cranberries are not used for low ornamental plantings—the ground-cover type. But those who have seen where wild cranberries grow, or how they are cultivated (for their fruits) in the bogs of Cape Cod, New Jersey, etc. will understand the reason: most people do not have bogs in their gardens. For the amateur who is experimenting with unusual plant materials, it would be well worth while to take the trouble to provide the light, acid, and constantly moist soil which favors the growing of cranberry plants.

Cranberries ready to pluck

McFarland photo

COLLECTORS' ITEMS AMONG THE HEATHS

A few of the less common native ones for rock garden enthusiasts

Alys Sutcliffe

Closely related to rhododendron is Labrador tea (*Ledum groenlandicum*), a low shrub with evergreen leaves covered with brown "wool" on the underside. The leaves are fragrant when bruised, and contain a volatile oil with narcotic properties; they were used as a tea substitute during the Revolution. The plant has small white flowers in rather showy clusters, in May and June. It grows wild from Pennsylvania northward, in bogs and damp thickets, and on mountain slopes. Wild Rosemary (*Ledum palustre*) is similar but lower, and with narrower leaves; it is native all the way across the continent—from Newfoundland to Alaska.

"Andromeda" is a name often incorrectly used for Pieris. But there are two native plants which are properly called Andromeda. One is the bog Rosemary (*Andromeda glaucophylla*), which grows in the same environment and range as Labrador tea. It has evergreen leaves, white on the underside, and attractive light pink flowers in dense clusters. *Andromeda Polifolia* is similar but more graceful, has looser flower clusters, and is restricted to more northern regions.

Any of these shrubs may be used as additions to the rhododendron border or the rock garden.

Another group in the family includes several plants that look somewhat like small editions of the true heath (*Erica*).

The alpine-azalea (*Loiseleuria procumbens*) grows very low (rarely as tall as 8 inches), in dense evergreen tufts. It has little white or pink bell-shaped flowers in small dense clusters, and is native in subarctic regions and on high mountains in the North. It is an attractive little plant, but difficult to grow out of its home surroundings.

There are several kinds of mountain-heath (*Phyllodoce*) growing in the Rocky Mountains and southward to California. But a particularly attractive one, *Phyllodoce caerulea,* grows on the high mountains of Maine and New Hampshire. It has clusters of delicate purplish urn-shaped flowers. It will grow in a cool shady place in the rock garden, in peaty soil, well-drained but moist.

In a similar situation one may try either the western or the eastern Cassiope. The eastern one, *Cassiope hypnoides,* found on the higher mountains of New England and New York State, grows in moss-like tufts, sometimes as much as 4 inches tall. It has graceful delicate white or rose-pink bell-like flowers, borne singly, not in clusters. It is essentially an alpine plant, and does not thrive where the air becomes hot and dry; but it will grow in full sun, creeping among other low plants, and it is a real joy to the collector of such plants.

Mountain-heath

Louis Buhle photo

Heath (*Erica*), an evergreen 12 to 18 inches high.

Heather *(Calluna)*, Mixed Varieties

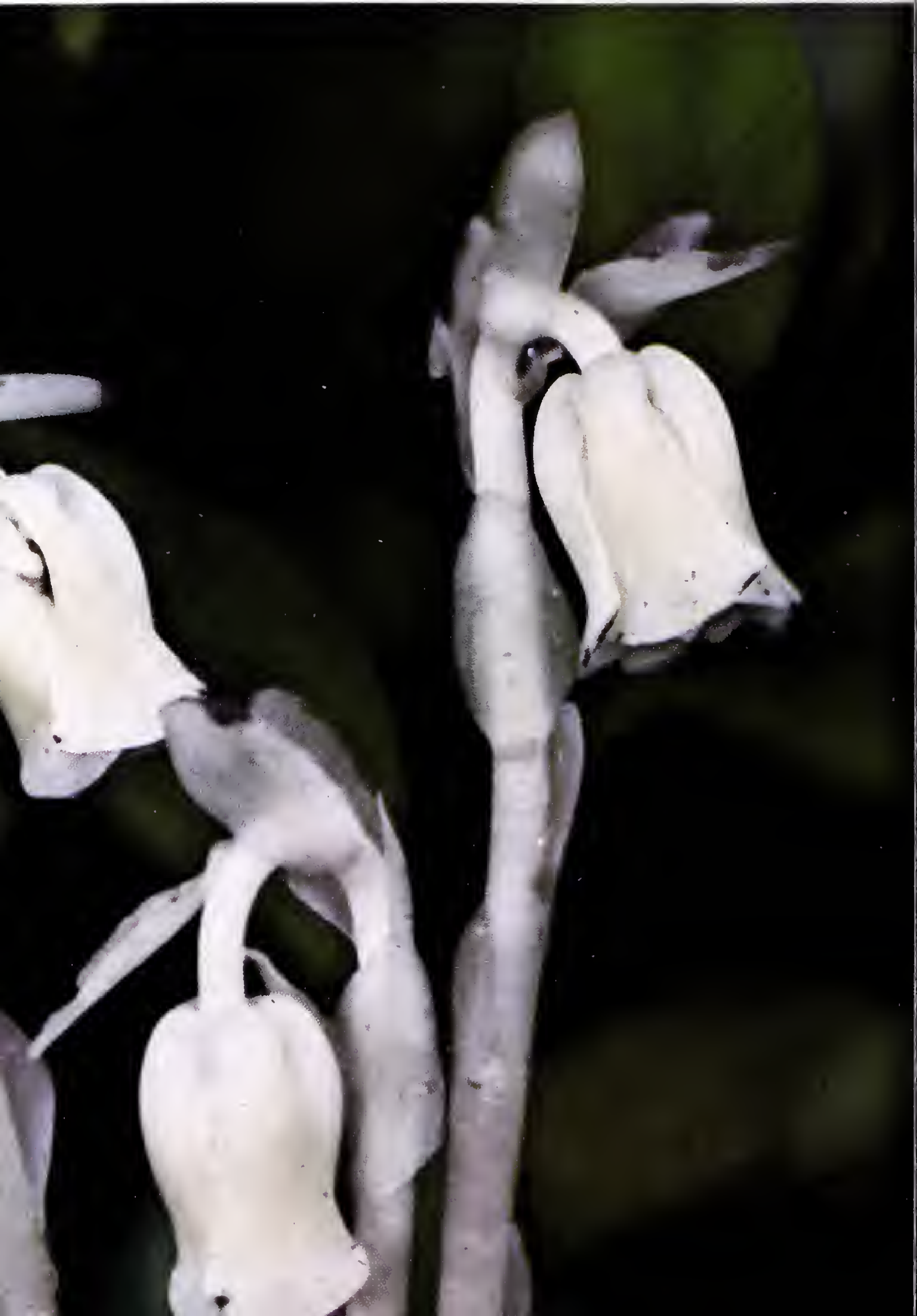
A Hybrid Rhododendron

r in the
ng Border

Torch Azalea *(Rhododendron obtusum var. Kaempferi)*

Indian Pipe or Corpse-plant *(Monotropa uniflora)*, larger than life size

[Indian Pipe, Pinedrops *(Pterospora andromedea)*' and Sweet Pinesap *(Monotropsis odorata)* are the most unusual relatives of the Heath family, in that they have no green color. (The green leaves in this picture belong to another plant.)



THE MYSTERY OF INDIAN PIPE

"Drama in everyday life"

Sally Kelly and Hester M. Rusk

How the Indian pipe lives has long been a subject for study and controversy, and constitutes one of the most fascinating chapters in the story of plant life. The Indian pipe (*Monotropa*) has no green leaves. It is pure white, soft, and fleshy; and consists merely of a cluster of short stems rising directly from the ground, each ending in a single waxy flower turned down. The first people to study it thought it was a parasite; for its lack of green color shows that it is not an independent plant. This statement may need a little explanation.

Plants with green leaves are able to make their own food, in the leaves. But any plant without green coloring matter must get its food ready-made. Besides Indian pipe, other plants that are not green include mushrooms, toadstools, black and white bread mold, mildew, and most disease germs. Some of these, as the last group, are parasites, taking their food from living plants or animals, or human beings; others, such as bread mold and mushrooms, get their living from dead or decaying vegetable matter or animal wastes.

Early observers, noticing that the Indian pipe's roots were tangled with humus material and tree roots, jumped to the conclusion that the Indian pipe derived its nourishment (parasitically) from the roots of the living tree. But closer study showed that there was no actual connection with the tree; and then the assumption was made that the Indian pipe lived on decaying vegetable material.

Both of these explanations were plausible and possible; and each, in its turn, served for a long time to satisfy inquiring minds. But the real truth, which was finally revealed, is much more dramatic: a fungus (somewhat resembling the fluffy white bread mold) was discovered living on the outside of the Indian pipe's roots, covering them entirely with a felt-like mass of living threads which completely bars the roots from direct contact with the soil. Therefore the only way the Indian pipe roots can possibly get any nourishment is through the medium of the fungus. Besides wrapping themselves around the Indian pipe's roots, the fungus threads grow outwards into the soil; here they digest decaying leaves and twigs and incorporate them into their own structure. Some of the threads also penetrate into the roots; but here they find an environment not altogether congenial. As fast as they grow in, they are themselves digested by the root and used as food by the Indian pipe. It is thus that the Indian pipe is nourished.

Many plants that have green leaves (including members of the heath family and numerous others) also have fungi growing on their roots, and obtain part of their nourishment from these lowly plants. A scientific account of the whole subject of fungus-nutrition in plants, by Arthur Pierson Kelley, is about to be published by The Chronica Botanica Company.

The color illustration of Indian pipe on the opposite page is presented through the courtesy of E. R. Squibb & Sons and Mr. Rutherford Platt.

HEATHS OF THE PINE BARRENS

Native shrubs in forests and bogs

M. A. Chrysler

THE term "heath," as applied to a plant, brings to my mind a low shrub, occurring in extensive masses, and perhaps giving a purplish cast to the landscape. But this would fail to give an accurate picture of conditions in the pine barrens of New Jersey. This region is by no means a treeless waste; but bears forests of pitch pine and of oaks, with the lower places occupied by white-cedar (*Chamaecyparis thyoides*) and sphagnum bogs. In each of these situations members of the heath family occur; and it is convenient to distinguish the plants of the dry barrens and those of the wet barrens. This diversity in kind of environment (habitat) partly explains the surprising array of members of this family found in south Jersey. Witmer Stone, in "Plants of Southern New Jersey," lists twenty-four different heaths and blueberries, to which a few closely related plants may well be added.

Flowering branches of leather-leaf

McFarland photo

Wet Barrens

Considering first the representatives found in the wet barrens: the leatherleaf (*Chamaedaphne calyculata*) is one of the commonest species, occurring in extensive masses in sphagnum bogs, making up in quantity what it lacks in beauty. In May it is somewhat effective while the sheet of white flowers covers the bog; but as an individual, it is an awkward-looking plant, out at the elbows, and leading a truly drab life. The adaptability of the plant is indicated by its range from Labrador to Georgia and all the way across the continent. Like all the other denizens of the wet barrens, it thrives in a more or less strongly acid soil.

The highbush or swamp blueberry (*Vaccinium corymbosum*), with its varieties and the immensely valuable cultivated forms, has become one of the mos prominent members of the family, anc demands separate consideration.*

Rather closely related is the lowl cranberry (*Vaccinium macrocarpon*) o open bogs. Cultivation of this plant i undertaken on a broad scale, and involve a quite specialized technique—particularly if one wishes to harvest cranberries

One of the most attractive plants of th wet barrens is undoubtedly the clamm azalea, or white swamp honeysuckl (*Rhododendron viscosum*); during Jun it fills the air with its delicious fragranc It does best in a somewhat shaded situation, in contrast with the leather-leaf.

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* See article on blueberries, p. 41.

Scarcely belonging to the wet barrens is the purple azalea, or pinxter-flower (*Rhododendron nudiflorum*), properly a plant of woodlands, surely the most beautiful representative of the family. It is frequent in the regions west and north of the barrens.

The great-laurel, or rose bay (*Rhododendron maximum*), so familiar to those who visit the Delaware Water Gap or the Poconos, has been found in a few places in south Jersey. It surely stretches the application of the term "heath" to include this noble plant in our list; but the occurrence of an upland tree-like shrub on the heated coastal plain is the most surprising feature of the record.

Not strictly a heath, but closely related, is the sweet pepperbush (*Clethra alnifolia*). This belongs to the wooded swamps, especially near the coast. In midsummer the spicy fragrance of these white flowers replaces the sweetness of the clammy azalea.

Dry Barrens

Passing to the heaths of the dry barrens, it may be well first to clear up the difference between blueberries (*Vaccinium*) and huckleberries (*Gaylussacia*). Apart from the technical distinctions, the most obvious difference is that a blueberry has many seeds, but they are small and soft; while a huckleberry has not

Pinxter-flowers adorn the woods in May

McFarland photc

more than ten seeds, but these are hard and gritty, rendering the fruit less palatable. Some kinds of blueberries are black, and some huckleberries are blue; and so the color is not very helpful to the amateur who wants to distinguish one from the other. In the field it may be observed that the leaves of most kinds of huckleberry are sprinkled with shiny, sticky, yellow dots—but this will not help you in the market. The blueberries of the dry barrens are low shrubs (about a foot); they do not bear so many or so large fruits there as in colder climates. Among the huckleberries, the dangleberry (*Gaylussacia frondosa*) is the best.

The two "laurels" of the barrens are deservedly admired by all visitors. Although the mountain-laurel (*Kalmia latifolia*) is the more valuable, the sheep-laurel (*Kalmia angustifolia*) is conspicuous because of its crimson flowers. Generally its growth is more or less choked by other shrubs; and it rises to its full possibilities only after a severe fire. I shall not forget the wonderful display of this and other heaths (also of the turkey-beard) which adorned the barrens at Albertson Brook the year after a fire had swept through the region.

Another of the heaths which produces its best effect when growing in open ground is the stagger-bush (*Lyonia mariana*). The large white urn-shaped flowers are produced in abundance, and give the shrub high rating as an ornamental. The common name refers to the fact that cattle which eat the plant become affected by the disease called staggers; sheep laurel also has a bad reputation in this regard.

The closely related male-berry (*Lyonia ligustrina*) is a much less attractive plant than the stagger-bush. The flowers are very small, but packed in large bunches. The plant is common in moist thickets in the barrens.

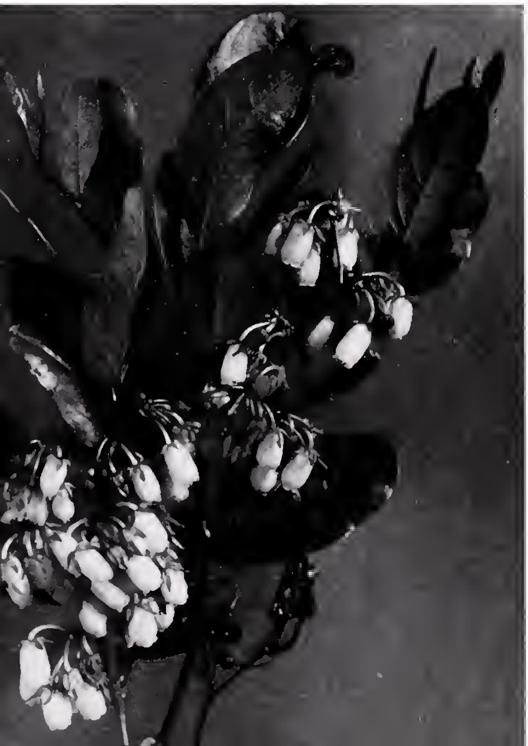
One of the most beautiful of the heaths is the sand-myrtle (*Leiophyllum buxifolium*), a shrub of medium height (up to 3 feet), not very common, restricted to the true barrens, and growing in moist sand. As the Latin name *buxifolium* implies, the leaves resemble those of the box. The period of flowering is a relatively short one, mostly in May; and at that time the plants are a mass of small fluffy white flowers, which are attractive to various insects.

In moist thickets one is likely to find another white-flowered shrub, the fetter-bush, or sweetbells (*Leucothoe racemosa*), recognized by the one-sided long clusters of narrow pointed flowers.

Of far greater beauty is a modest and retiring member of the heath group, the trailing arbutus (*Epigaea repens*), a plant much admired and too much sought after. As early as April the fragrant clusters of flowers may be found in many parts of the sandy barrens. Fires work much damage to the plants, and careless picking destroys many of them; a sharp knife or scissors should be used—if trailing arbutus is to be picked at all!

Stagger-bush flowers

McFarland photo



McFarland photo

Fragrant flower clusters of sweet pepperbush

The bearberry (*Arctostaphylos Uva-ursi*) is another of the low-growing members of the heath family, especially characteristic of the tracts known as plains, but found in numerous places. The globular pink flowers, though minute, are attractive; while in late summer the richly colored fruits enliven the dreary plains. The leaves are medicinal, and go by the name "uvursy" (from the Latin name of the plant).

One of the trailing small shrubs completes the list: the aromatic wintergreen, or checkerberry (*Gaultheria procumbens*), a common plant of woods and clearings. Its delicate flowers and brilliant berries are well known. Both the young leaves and the berries are gathered on account of the fragrant oil of wintergreen which they produce.

In a closely related family is a remarkable plant of the sandy barrens, the pyxie, or flowering-moss (*Pyxidanthera barbulata*), found only from New Jersey to North Carolina. In early spring the mat-like masses of the plant are enlivened by a multitude of small star-like flowers. This interesting plant may reasonably be included with arbutus, bearberry, and wintergreen, as representing the prostrate group of heaths.

* * *

Sand-myrtle

McFarland phot

HUCKLEBERRIES, EDIBLE AND ORNAMENTAL

How they look and where they grow

K. P. Jansson

HUCKLEBERRIES (*Gaylussacia*) are closely related to blueberries (*Vaccinium*), as most readers of *Plants & Gardens* know. There are about fifty kinds native to the western hemisphere, most of them growing in the mountains of South America, and a few in eastern North America. Huckleberries are easily distinguished from blueberries by the number of seeds in the fruit. In blueberries the seeds are small and numerous, and the berries very juicy. In huckleberries the seeds are few (only about ten), and bigger, and more noticeable in eating. Another distinguishing mark is that the leaves and young twigs of huckleberry are sprinkled with shining yellow dots or globules, which make the plant clammy to the touch.

Ornamental

The southern box huckleberry (*Gaylussacia brachycera*) has smooth evergreen leaves like box (*Buxus*). It is an exception, in not having the sticky dots. This plant is native from Pennsylvania to Virginia, but not hardy farther north. It is a very beautiful and ornamental low shrub, with small leaves; and is well worthy of cultivation. Also native from Kentucky to Georgia is the bear huckleberry (*Gaylussacia ursina*), a taller shrub, 3 to 4 feet high, with large leaves, 3 to 4 inches long. Its fruit is insipid.

Fruits of dangleberry

Elsie M. Kittredge photo

Edible

Of the northern huckleberries, the common or black huckleberry (*Gaylussacia baccata*) is the most widely distributed. It extends all along the Atlantic border, inland to Wisconsin, and south to Louisiana. It is a shrub 3 feet high, much branched, with leaves thickly covered with the shining resinous dots. The flowers are slender and reddish. This shrub grows abundantly in rather dry rocky woods and clearings. Another kind that grows in the same parts of the country as the black huckleberry is the dangleberry (*Gaylussacia frondosa*). This shrub grows taller, up to 4 feet, and is more slender. The flower clusters are slender and loose; and the flowers themselves are roundish bell-shaped and cream-colored. The fruit is sweet and delicious. This shrub grows in open moist woods or sandy rocky woods.

The dwarf huckleberry (*Gaylussacia dumosa*) is a low shrub, growing in sandy swamps; it is less common than the other two. The flower clusters are long; and there are tiny leaves among the pure white, broadly bell-shaped flowers. The fruit is not particluarly good (insipid to most of those who try it).

Perhaps the greatest economic value of huckleberries is in their use for pies! Huckleberries are sweeter and drier than blueberries; and many people prefer huckleberry pie, even though the seeds are more noticeable.

Elsie M. Kitt

Black huckleberry in fruit

The cultivation of huckleberries for commercial purposes has been neglected. But it is worth trying: huckleberries grow under the same conditions, and require the same acid soil, as blueberries—and, in the hands of the plant breeder, some hidden virtues might easily come to light.

* * *

EARLIER FLOWERS ON POTTED AZALEAS

Cold storage hastens the breaking of dormancy in potted azaleas, according to investigations at the Mississippi Agricultural Experiment Station. Plants of six varieties were kept at 40° F. for four weeks beginning October 1, and then were grown in the greenhouse at 60° to 65° F. These plants bloomed about two to five weeks earlier than similar plants not kept in cold storage. Coral Bells bloomed earliest of all; the other five varieties used were Christmas Cheer, Hexe, Hinodegiri, Snow, and Formosa.

Plants kept in the dark during the cold storage period suffered defoliation: Hinodegiri and Snow, severely; Hexe and Coral Bells, somewhat less. Defoliation was slight in plants supplied with light while in cold storage—light from 40-watt Mazda lamps ten hours a day.

CULTIVATED BLUEBERRIES

Their story from the beginning, by a pioneer

Elizabeth C. White

IN 1946 the crop of cultivated blueberries in three States, New Jersey, Michigan, and North Carolina, was approximately eleven and one-quarter million pints, and sold for approximately three and one-half million dollars. Of these New Jersey produced nine million pints, Michigan one and one-half million, and North Carolina about three quarters of a million.

Besides these three principal States there are commercial fields in Massachusetts, New York, Delaware, and Connecticut in the East; and in the West the same varieties of blueberries are grown in Washington, Oregon, and British Columbia.

All of this was started at Whitesbog, New Jersey, in the pine-barren section, where cranberries, blueberries, and many other plants of the heath family are native. It was started there in an effort to secure a suitable companion crop on a large cranberry bog.

In the first decade of the century my father and I were planning developments

Dr. Coville and Miss White, 1922. Notice Dr. Coville's "huckleberryometer," a gauge with round holes to measure the berries; and Miss White's notebook—both important tools.

McFarland photo

for The Bog. In 1910 he had his first crop of fifty thousand bushels of cranberries. Wild highbush blueberries (*Vaccinium corymbosum*), which the local people called "huckleberries,"* grew abundantly about the margins of the cranberry bogs. We used to go from bush to bush and judge the quality of the fruit. This one had berries that were too sour; those from the next bush were too mealy in texture; and then we would come to a bush whose berries my father would pronounce "peachy."

Blueberry bush in flower

Gottscho-Schleisner photo

We had acres of land that could not be used for cranberries because it could not be flooded—even though there was water running to waste after it had been used for irrigating the cranberries. We needed to stabilize our labor force with work for the slack seasons; and we needed another income crop before the last months of the year, when our cranberries were harvested. Also a second crop might succeed in an off year for cranberries. We knew the need of all fruit growers for a uniform high-grade fruit. Neighborhood farmer tradition said that "huckleberries" could not be cultivated or grown from cuttings. We did *not* know how to begin.

Early Experiments and Cooperation

In my zeal to find new ideas for use at The Bog, I was examining each month the list of new publications issued by the United States Department of Agriculture, and sending for any that promised help. I promptly secured "Experiments in Blueberry Culture," written by Frederick V. Coville and published in the last months of 1910.

I found it fascinating. It was a book of about a hundred pages. It told the reason for many phenomena with which I was familiar, such as why cranberries succeeded best on brown water streams. The brown water was acid. Best of all, it revealed that here was a man who had succeeded in rooting blueberry cuttings. If I could only get to know that man well, I might learn how to root cuttings myself. Conditions for growing blueberries, I knew, were not very favorable about Washington where he had to do his work. He might like to use facilities at The Bog, where wild bushes throve. My father and I discussed the possibilities. Early in 1911 I wrote a letter to the head of the Bureau of Plant Industry, offering the use of our natural blueberry land, a small amount of money to finance the experiments, and my assistance. Later I learned that "Experiments in Blueberry Culture" had brought Dr. Coville many requests for plants; but mine had been the only offer of assistance.

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* Throughout this article the term "huckleberry," as used by the New Jersey pine-barren natives, refers to *Vaccinium*, not to *Gaylussacia*.

Thus a close cooperation was started. It is hard to make one stick of wood burn well; but if two sticks are placed in the right relation one to the other, they burn brightly. Such were Dr. Coville's relations and mine for seventeen or eighteen years. We each had special knowledge and facilities which were needed in blueberry culture, and we were equally thrilled by each new development. During the course of this cooperation and because of the progress of blueberry culture, Frederick V. Coville had the title of Doctor bestowed upon him by Washington University. Because of advertising the blueberries, a post office was established at The Bog. This necessitated the choice of a name; "Whitesbog" was chosen, passed upon by the United States Geographic Board, and commended by the Post Office Department because it was the only post office of that name in the country.

Earliest Parents

When we started, Dr. Coville had two blueberry plants which he had selected

Blueberry bushes; netting placed over the rod prevents birds from eating the berries

Gottscho-Schleisner photo

from near his summer home at Greenfield in southern New Hampshire. One of these was a specimen of highbush blueberry (*Vaccinium corymbosum*), which he called "the Brooks"; the other was a specimen of lowbush blueberry (*Vaccinium pennsylvanicum* var. *angustifolium*). From these he had a few hundred plants, some grown from cuttings, others from seed. Some of the seedlings were from berries resulting from open pollination in the wild, others from controlled pollinations made in the greenhouse.

The Search for Better Parents

It was at once evident that more, and if possible better, parent material was needed. I undertook to find it, with the aid of the people who lived in the pines where the wild swamp "huckleberries" grew. These people were accustomed to picking the blueberries (which they called "huckleberries") for a living during July and August; and in September and October they helped us pick our cranberries. Consequently I knew many of them well and on a friendly basis.

Blueberries, Rubel variety
McFarland photo

This search began in a small and informal fashion, by talking to Zeke Sooy, who had been one of our foremen and was then making his living during the season by taking his large family of children into the swamps to pick "huckleberries." In succeeding seasons the search was better organized. Handmade advertisements were put up in the little stores where "huckleberry" pickers traded. Packages for the searchers were prepared, including a measure for the berries, tags for the bushes, and means of preserving the berries for a week or more till they could be brought to me.

Those were still horse-and-buggy days over the sandy roads of the pines and along the edges of "huckleberry" swamps. Though automobiles were becoming fairly common near the cities, they were not used much in the pines; and it might be a week or more before the busy pickers could get the berries to me. Three or four agents were appointed at strategic points. (Alfred Stevenson at Chatsworth, who had grown up at what later became Whitesbog, was the most successful in inspiring the pickers with my enthusiasm.) In this way an area with a radius of twenty miles from Whitesbog was covered.

Some school children took part in the search; but for the most part the finders were experienced woodsmen, men who had the skill to find one special bush among acres of bushes growing hit or miss in the wild. The finders usually received a dollar for marking some especially fine bush that they found in the course of the day's picking, and then were paid a half day's wages for the hour or two required to guide me to that bush. If possible, I visited the bush while it was still in fruit; but I could not do that in the majority of cases. I always had to be guided to a bush when it was to be dug, in the early spring or in the late fall. From 1911 through 1916 there were thus located an even hundred superior bushes.

Propagation

When the bushes were dug they were always dismembered, and usually cut up into 6- to 8-inch pieces which were used for starting new plants. These new plants were set out in rows in a field, where they were grown to fruiting stage; they were carefully watched and compared as to growth and fruiting characteristics under uniform cultural conditions. Of each of the more promising bushes a portion was always given to Dr. Coville for his work in the greenhouses in Washington.

Early Named Varieties

During the summer of 1911 Zeke Sooy found three bushes for me. One of them, which was later known as the Sooy, had its largest berries ⅝ inch in diameter. Wonderful! The largest berry on the Brooks had been only ½ inch. Many different crosses were made between Brooks and Sooy, and some three thousand seedlings were tried out in the field under my care and close observation. Among these three thousand we found four or five plants which bore berries ¾ inch in diameter; two of these were named and extensively propagated. Of these the Katherine was found to have stalk fibers extending into the heart of the berry somewhat like those of a Concord grape. The berry tore so badly when picked that the variety was soon discarded from all commercial fields. It was found later that the Katherine had inherited this characteristic from its Brooks parent.

The other (and first named) variety selected from the Brooks-Sooy cross was Pioneer. It was extensively planted in commercial fields, and has become one of the ancestors of many better varieties that have resulted from continued breeding and close selection.

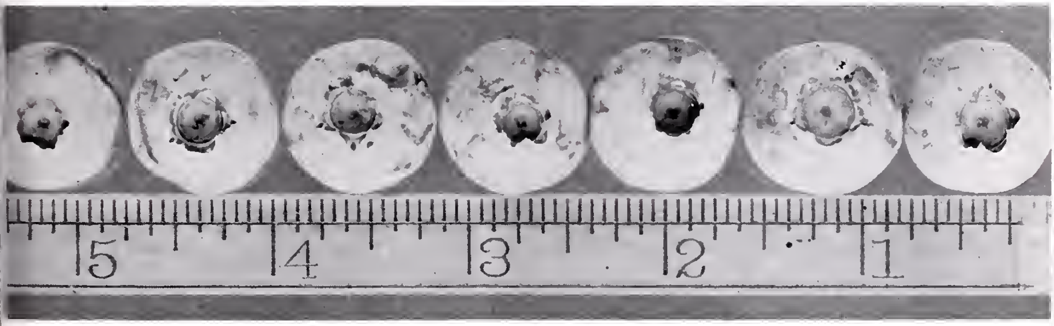
One remarkable characteristic of the Brooks-Sooy cross, a most fortunate circumstance for the infant blueberry industry, was that a few of the progeny were much larger and better than either parent. This characteristic was found in very few of the combinations of the original wild bushes. Through the Pioneer it seems to have been passed on to later generations.

Thus the increase in size of the cultivated blueberry over its wild ancestors has resulted from drastic selection among the wild bushes and among the large number of seedlings that have been tried. Literally hundreds of thousands of good, but not highly superior, blueberry plants have been destroyed. One has to develop great hardness of heart to throw away so many plants on which so much thought and work have been expended.

The finders of the wild plants were

Large berries from one of the Rubel crosses

McFarland photo



encouraged by being told that theirs might prove to be the very best bush ever found; and in most cases the bush was named for the finder. Thus the bush found by Jim Adams was called the "Adams"; that found by Ralph Harding, the "Harding"; and the one found by Theodore Dunfee, the "Dunfee." When, in 1916, Sam Lemmon found a bush with ¾ inch berries, light blue and lovely-looking, we thought Lemmon would never do as a name; and so we called it "Sam." This variety never lived up to our early expectations.

I had learned to bud that summer, and was most eager to increase as fast as possible this (as I then thought) finest bush of all. We had no prepared stocks into which to insert the buds. But the plants along the dams at Whitesbog had been trimmed that spring, and here and there the cut "huckleberry" bushes had sent up fine new sprouts. These would serve very well for stocks. I telephoned Alfred Stevenson at Chatsworth, ten miles away, telling him just what kind of wood to cut for the buds; that all the leaves must be cut off; and that a little of the stem must be left, to be used as a handle when the bud was inserted. The bud wood had to be put on ice, carried to the bush, and kept there. I spent two or three days inserting those buds, days when the thermometer registered 100 degrees in the shade; and the work had to be done in full sun.

We planted several acres with plants raised from cuttings made from these bud sprouts. The variety was increased much faster than had been possible with bushes found earlier. The variety "Sam" was used liberally as a parent, but none of its progeny compared favorably with the best. It does not figure as a parent in any of the varieties accepted today.

An important bush was one found by Rube Leek, under the influence of Alfred Stevenson, four years earlier than Sam. The berries were only ⅝ inch in diameter; and, though it was a nice clean bush, it attracted no especial interest in either Dr. Coville or myself. I kept notes on the Rube Leek bush for some years. Dr. Coville objected to compound names; he said Leek savored of onions, and Rube seemed no name for an especially aristocratic bush. Dr. Coville suggested that we use Rube with the initial of the last name; and so the name "Rubel" was coined. This variety has become the the standard of comparison for all others.

The Rubel variety is simply one wild bush, divided and divided again till it occupies many hundreds of acres. With this exception, all cultivated blueberries are descended from some combination among the two wild bushes selected by Dr. Coville in southern New Hampshire and five of the hundred superior wild bushes which my pine-barren friends located here in New Jersey. Crosses among these seven have been made in many combinations; and have been carried to the second, third, and fourth generation.

All the acceptable crosses today have Rubel in from one to several of their ancestry lines. It has given stability and good balance to its progeny. It is the only one of the original wild bushes tried that is not almost or entirely sterile to its own pollen. Rubel sets good crops when it is pollinated with its own pollen, but the berries are slightly smaller and later than when it is cross-pollinated.

Testing of Seedlings

From 1912 to 1928 at least 98 per cent of Dr. Coville's seedlings were tested under my care at Whitesbog. I am familiar with the parentage and results of his seedlings tested since 1928 at Weymouth. I have also produced several hundred thousand seedlings of my own since then.

Of the hundreds of crosses made by Dr. Coville and myself not more than one in ten has produced progeny better than the parents; and of the good crosses not more than one plant in a thousand has been counted sufficiently good for commercial use. It was pure luck that the parents of Pioneer and Katherine were of the few blueberry plants which made great improvement in size and flavor in a few of their progeny.

My early offer of a little money to carry the expenses of the blueberry experiments was never accepted. But after Dr. Coville became aquainted with the facilities we had to offer, a formal contract was made between the United States Department of Agriculture and my firm of Joseph J. White, Inc., to test blueberry seedlings. By this contract we were to receive 50 dollars per acre, per year, for four years, for each lot of seedlings that we tested. We were to provide all necessary care, and have all fruit produced except such samples as were needed in Washington. At the end of four years, for each lot of seedlings, the plants were ours; but we had no right to sell or give away any portion of them without permission from Washington.

In the early years, when the fruits from these miscellaneous seedlings had to compete only with wild berries in the market, their sale went a long way towards paying the experimental expenses. But by 1928 we had some acres of Rubel, Sam, Harding, Pioneer, and other uniform varieties. When the berries from the seedlings had to compete with the fruit from these varieties, the twenty acres that we then had planted to seedlings became a liability rather than an asset. We could no longer afford to renew the old contract. Dr. Coville then entered into a similar contract with another cranberry grower at Weymouth, New Jersey.

Commercial Methods

Dr. Coville's success in propagating blueberries was what made me seek him out in the first place; but his methods by no means entirely solved the problem of commercial propagation. We tried many methods, the details of which are too many for this article. A comparatively easy and cheap method for New Jersey was finally worked out by Thomas Windon, who worked with me at Whitesbog for some twenty years. He used a house made of laths placed about as far apart as the width of the lath. Under

Two blueberries—a teaspoonful

McFarland photo

such a house are beds of sand and peatmoss, in which the cuttings are planted. These lath houses are now to be found all through the pine region in New Jersey. Blueberries are now so readily propagated that the older varieties, Rubel, Pioneer, Cabot, etc., are listed in the catalogs put out by Sears Roebuck and Montgomery Ward: a far cry indeed from the days when it was said blueberries could not be propagated.

In 1927, when there were a few other growers, but while 90 per cent of the berries were still grown at Whitesbog, a Blueberry Cooperative Association was organized. Today Mr. Stanley Coville, the eldest son of Dr. Frederick V. Coville, is the manager of the Blueberry Cooperative Association. He gave me the crop figures at the beginning of this article. The majority of the berries from these three States are sold under the Coop's master brand, Tru-Blu-Berries. Mr. Stanley Coville was the pioneer in developing pruning of blueberries.

The industry of cultivating blueberries has now taken its place with the older fruit industries. It has diseases and insects to combat, problems of organization in selling, and possibilities of greatly improved varieties and methods of cultivation. Besides many growers, workers in the United States Department of Agriculture and in the New Jersey, Michigan, North Carolina, and other State Agricultural Experiment Stations are working on these problems. All success to them and to the industry!

GARDEN CULTIVATION OF BLUEBERRIES

For garden cultivation blueberry plants can be set 4 feet apart in rows 8 feet apart; this is usually sufficient for permanent spacing; but if the plants grow very strongly it may later be wise to take out every other plant in the row, leaving the plants 8 × 8. To provide for cross-pollination it is advisable to plant more than one variety. The ground should have good drainage, and sand and leaf mold; in sections where the soil is not acid, oak leaves should be added, or if necessary, even aluminum sulfate.

The soil may be cultivated enough to keep weeds down; or a heavy mulch of leaves may be used for this purpose. If a commercial fertilizer is desired, one analyzing about 5–10–5 should be good under most conditions.

Where small quantities of blueberries are grown, the birds are likely to get them if they are not covered with mosquito netting or wire.

AN UNUSUAL SMALL HEATH

A beautiful member of the heath family which is not well known is the spike-heath (*Bruckenthalia spiculifolia*), native in southeastern Europe and Asia Minor. It is very closely related to the true heath (*Erica*). The spike-heath is an evergreen plant, not more than about 6 inches high. It forms large tufts of bright green, covered with pink bell-shaped flowers, which last for a period of weeks in June and July. It is quite hardy in the North, and succeeds under the same conditions as the true heath, in a peaty, well-drained soil. It has flourished in the Rock Garden of the Brooklyn Botanic Garden for several years. It could also be used as a border in a planting of other members of the heath family.

HOW TO PROPAGATE TRAILING ARBUTUS

Something about shinleaf and the wintergreens, too

Florence L. Barrows

TRAILING arbutus, or Mayflower (*Epigaea repens*), is very much in need of protection and conservation. Fortunately it can be propagated, and can be grown by anyone who learns the rules of the game.

Requirements

Arbutus is considered an acid-soil plant, but it has been found to grow also in soil that is approximately neutral. Acidity is undoubtedly important, as shown by favorable growth with mulches of granulated peat-moss or pine needles; but good drainage, plenty of moisture, and partial shade are also needed.

These requirements are probably essential for the growth of the associated fungus which is found in the roots of healthy plants. In nature arbutus may be found on edges of oak or pine woods; along the sides of old logging trails; in sloping pastures, especially with a northern exposure; on hummocks in low lands; or close to a rock where the roots receive moisture. Large leaves but few flowers are produced in very shady locations. Some of the plants producing the most numerous flowers grow in partial shade, but get sun part of the day. For commercial or home growing, slat shade on a cold frame is desirable, or a brush shed.

Cuttings

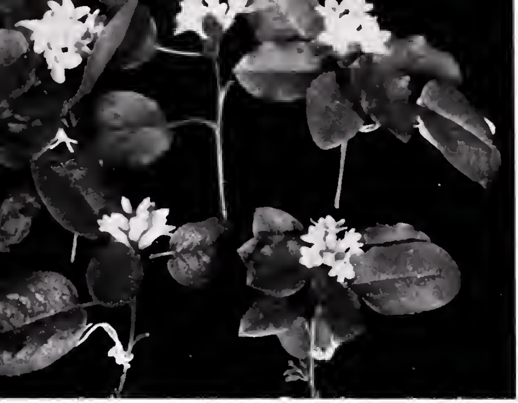
One may propagate arbutus by cuttings or by seeds. The cuttings root readily in a mixture of sand and granulated peat-moss. When rooted, they may be transplanted to pressed peat pots and put into flats surrounded with damp peat-moss or sphagnum. They can be set into the ground, pot and all, without disturbing the roots.

Seeds

The fragrant flowers are pollen-bearing and seed-bearing on separate plants; that is, the plants are of different sexes. It is a simple matter to pollinate them, using forceps to pick off the pollen-bearing flowers and brush the pollen on the pistils of the seed-bearing plants. There

Laboratory culture of the fungus that grows in the roots of trailing arbutus

Boyce Thompson Institute photo



Boyce Thompson Institute photo

Trailing arbutus: pollen-bearing flowers above, seed-bearing flowers below

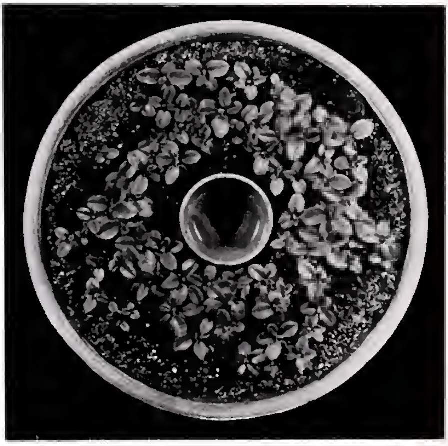
is no need of bothering with bags, or worrying about foreign pollen, as there is no other native plant closely enough related to cause trouble. In two or three weeks after pollination, the young seed capsules will be set; and they develop at the same time as the new shoots.

Having plants conveniently located makes it easier to pollinate, and to watch the developing capsules. One is more likely to secure a good seed crop if he can watch the capsules daily. The seeds ripen in late June or early July; and are very popular with ants, slugs, and chipmunks. One has to be alert to harvest the crop of seeds, and must pick the capsules as soon as they show the first signs of splitting. Capsules vary considerably in size, and may produce from about 100 to approximately 550 seeds. On the average one could expect perhaps 200 to 250 seeds per capsule. Plants with a number of capsules may yield up to 2000 to 4000 seeds; and so a few plants, once established, should yield a good crop of seeds.

Ripe seed capsules of trailing arbutus

Photo by Boyce Thompson Institute for Plant Research, Inc.

The fungus which occurs in the roots is also found in the capsules and on the seeds. Usually good germination is secured if the seeds are sown (soon after harvest) on a mixture of leaf mold, peat, and sand in a double pot, such as is shown in the illustration. The center pot should be kept filled with water (preferably distilled), and the whole should be covered with glass until the seedlings are up. Then the glass should be raised gradually to allow more air. Care must be taken not to let the seedlings become dry. When they are large enough to handle with forceps, they may be transplanted to similar double pots, especially if they are crowded. Later, when the little rosettes of leaves have formed, the plants may be put into single pots. Pressed peat pots are preferable to clay pots. In either case, packing with damp peat or sphagnum moss helps to maintain even moisture.



Boyce Thompson Institute photo

Trailing arbutus seedlings in a double pot (small pot in center kept filled with water)

If the seedlings started in July can be kept in a temperate greenhouse the first winter, some of them may flower in about

Boyce Thompson Institute photo

Trailing arbutus seedlings in peat pots (flowers twenty-one months after planting seeds)

twenty-one months. Not all the plants will bloom so soon; and in nature seedlings probably take two or three years to reach blooming age.

Successes

Trailing arbutus is being grown successfully from seedlings or cuttings by several professional nurserymen. About twenty-five years ago Dr. Edgar T. Wherry mapped the acidity on a Long Island estate; and a fine colony of arbutus was established on a ridge under white pines. In the wild garden of the Brooklyn Botanic Garden arbutus has been established in sand in the shade of mountain-laurel. Also in Brooklyn, a home wild flower garden was made in the shade of a hemlock tree, with arbutus and pink lady-slippers transplanted from a farm in northeastern Connecticut. These rare wild flowers were naturalized in a small plot surrounded by tall brick buildings. The author has established a small colony under the eastern edge of some white pines that form a windbreak for a New England farmhouse.

Problems

Pink flowers are more highly prized than white ones. Even the brightest pink ones gradually grow paler with age. It is not yet known whether pink and white flower color are inherent, in arbutus, or whether they are the result of conditions of culture. It would be interesting for someone to try to find out whether the degree of acidity in the soil affects the color. Another useful experiment would be to cross pink-flowered plants with white, and watch the flower color of the hybrid seedlings and their offspring. [See article on "How to Hybridize Plants," p. 9.]

Pipsissewa

Several other attractive small plants with evergreen leaves and dainty flowers are related to trailing arbutus, and are likewise in need of conservation. Native to open woods in a large part of the country are princes-pine, or pipsissewa

Pipsissewa in bud

Gottscho-Schleisner photo

(*Chimaphila umbellata*), and spotted wintergreen (*Chimaphila maculata*). The latter is not really spotted, but has the upper surfaces of the leaves attractively marked with white. The leaves are sometimes used in terraria or in the glass goblet gardens for sale by florists. The waxy flowers appear in June or July (occasionally in early August), and are followed by dry brown capsules filled with small seeds.

Shinleaf

Shinleaf (*Pyrola*) has rounded evergreen leaves, which reminded someone of old-fashioned shin plasters, and fastened the common name upon these wild plants. The flowers are waxy, and creamy white to greenish, appearing in June or July, about the time wild roses are in bloom. Shinleaf ranges over a variety of soils, from hummocks in bogs to hill pastures, and seems to be able to endure more sunshine than princes-pine or spotted wintergreen.

Aromatic Wintergreen

Aromatic wintergreen, or checkerberry (*Gaultheria procumbens*), is well known for its spicy red "berries" and evergreen leaves. But perhaps the waxy white bell-shaped flowers of July and August are less familiar. The plants spread into large colonies by underground creeping stems. They may be found in old pastures, meadows, or low boggy areas; or even on sandy, rather poor soil along new state highways. The young leaves or tender "pippins" are delicious to chew, especially if followed by a drink of cool spring water, as is well known to many country children. The leaves turn a rich reddish bronze in late fall, or when exposed to full sun. Together with the red "berries," they are often used in winter terraria. The checkerberry is probably more abundant and widespread than any of the other plants mentioned here. It sometimes occurs near or with the trailing arbutus.

Spotted wintergreen in flower

Elsie M. Kittredge photo

McFarland photo

Shinleaf growing among ferns

Challenge

Robert S. Lemmon, in *The Home Garden* for January 1947, says that tip cuttings of princes-pine and spotted wintergreen can be rooted. Caroline Dunham, in *Wild Flower*, October 1946, reports rooting cuttings of pipsissewa, trailing arbutus, and aromatic wintergreen. With the loss of native stands of these plants, due to the extension of highways, the devastations of hurricanes and subsequent lumbering operations, the change from open woodland to densely shaded areas, and the thoughtless picking of these rare wild flowers, the need of conservation is obvious. Why not try your "green thumb" on trailing arbutus, or work out a technique for propagation of shinleaf, princes-pine, or the wintergreens?

* * *

EROSION CONTROL AND 2–4–D

Grasses planted on terraces, etc., to control erosion, are not injured by 2–4–D. This is one great advantage of the use of 2–4–D for killing many broad-leaved weeds in rough areas, fence rows, and grassed ditches; along roadways; and on erosion-control terraces or outlets—the weeds are destroyed, the grasses remain. If the weeds are numerous, reseed the thin spots after the weeds are killed.

McFarland phot

Sweet pepperbush in bloom adds elegance to the garden in summer

THE HEATH FAMILY IN A CITY BOTANIC GARDEN

Reviewing heath culture extending over many years

Arthur Harmount Graves and Hester M. Rusk

THE Brooklyn Botanic Garden is situated in the midst of one of the world's largest population centers. Comprising only about 50 acres, it is not a large garden, but together with adjacent Prospect Park (530 acres) it provides a breathing space for plants as well as people. Because of this comparatively large area, it may not be fair to assume that the following record would apply to every garden within a large city where the environment—smoke, soot, dust, noxious gases, etc.—would necessarily be unfavorable.

The plants growing in the Wild Flower Section of the Garden have had individual provision for their particular needs; many of them would not succeed at all without this attention. The Wild Flower Section is a special area where the majority of our attractive native wild flowers occurring within 100 miles of New York City are growing. It includes several ecological groupings such as bog plants, meadow plants, woodland plants, plants of the sand barrens, of the pond or pond margin, etc.

Some members of the heath family have been quite intractable even in the Wild Flower Garden; for example, shinleaf (*Pyrola*), and spotted wintergreen and princes-pine (*Chimaphila maculata* and *umbellata*). The last two have been brought in from Connecticut where they thrive, but their days in the City have always been numbered. The fact that most if not all heath-like plants may require certain root fungi seems to explain the difficulty. Our knowledge of this situation is as yet limited. There is need for careful research here.

Following is a list of the members and close relatives of the heath family growing in the Brooklyn Botanic Garden—where they have lived successfully for fifteen years or more. The list is classified according to culture conditions; and within each group the order is alphabetical by common names. All but the last group are growing in the Wild Flower Section.

Some of the plants are hard to classify because they can be found in nature in various kinds of environment. For example, the creeping snowberry grows both in peat bogs and in mossy woods; the black huckleberry and the highbush blueberry either in rocky woodlands or in swamps. It may very well be that the

Swamp azalea

Elsie M. Kittredge photo

McFarland photo

Sand-myrtle

presence of the right kind of root fungus is more important than the amount of moisture in the soil.

BOG

American cranberry (*Vaccinium macrocarpon*) is well distributed throughout the bog. It is not very vigorous, yet it grows well, blossoms, and fruits occasionally.

Leather-leaf (*Chamaedaphne calyculata*) has grown here for many years in peaty soil. According to our records this plant used to grow in swamps near Flushing, and also near Astoria, L. I.

Pale-laurel, or **bog-laurel** (*Kalmia polifolia*), is not thriving, but lives on.

Creeping snowberry (*Chiogenes hispidula*), in this section of the country, is usually confined to the mountains. It is not thriving here, although it is planted in the cool shade of a stone wall, where bunchberry and other mountain plants succeed.

Fetter-bush

Louis Buhle photo

SWAMP

Azalea: **clammy azalea, swamp azalea, or white swamp honeysuckle** (*Rhododendron viscosum*).

Blueberry: **highbush blueberry** (*Vaccinium corymbosum*).

Great-laurel, or **rose bay** (*Rhododendron maximum*) has white or pinkish flowers. This is a native rhododendron, rare in swamps in New England and New York, but common in the southern Appalachians to Georgia.

Rhodora (*Rhododendron canadense*) blooms well each year. In Dr. John Torrey's "Catalog of Plants growing spontaneously within 30 miles of the City of New York," published in 1819, this plant is listed as growing in the woods about Flushing, L. I.

Sweet pepperbush (*Clethra alnifolia*), a close relative of the heaths, grows well here.

MOIST SANDY PLACES

Sand-myrtle (*Leiophyllum buxifolium*) is an attractive low shrub with clusters of small white flowers, a native of New Jersey and southward, but known particularly as an inhabitant of the pine barrens. It is not known to occur wild either in New York State or in New England. It blooms and thrives here.

McFarland photo

Deerberry

SANDY WOODS

Azalea: **purple azalea,** or **pinxter-flower** (*Rhododendron nudiflorum*), and its variety *roseum.*

Blueberries: **late low blueberry** (*Vaccinium vacillans*), and **low sweet blueberry** (*Vaccinium pennsylvanicum*).

Mountain-laurel bordering walk, Connecticut Arboretum

Connecticut College photo

McFarland photo

Aromatic wintergreen in bloom; Indian pipe in background

Dangleberry (*Gaylussacia frondosa*). One of the less common kinds of huckleberry.

Deerberry (*Vaccinium stamineum*) has very different-looking flowers and very different-tasting greenish berries from the true blueberries, to which it is closely related.

Fetter-bush (*Leucothoe racemosa*), sometimes unofficially called "tooth-brush bush," is usually found in moist thickets in the wild.

Huckleberries: black huckleberry (*Gaylussacia baccata*) does well here; also **dwarf huckleberry** (*Gaylussacia dumosa*), usually found in swampy places.

Mountain-laurel (*Kalmia latifolia*) is represented here by large, thrifty shrubs.

Sheep-laurel (*Kalmia angustifolia*), with narrower leaves than mountain-laurel.

Trailing arbutus (*Epigaea repens*) is growing under the mountain-laurel. It is protected during most of the year with lath frames, in winter with dead leaves also. It seems to be holding its own, and unfolds its dainty, fragrant flowers in April.

Wintergreen (*Gaultheria procumbens*). This tiny shrub grows well here. Oil of wintergreen is used for flavoring candy etc.; and in medicine as an antirheumatic and stimulant.

DRY OPEN SANDY PLACES

Stagger-bush (*Lyonia mariana*), with deliciously fragrant flowers.

Bearberry (*Arctostaphylos Uva-ursi*) has creeping stems densely covered with thick, small evergreen leaves, forming a mat on the ground. The specific name, *Uva-ursi,* means literally "grape of the bear" (in other words, bearberry). The leaves have been used in medicine. It is flourishing in our made-to-order sand barren. (A specimen of the broom crowberry (*Corema Conradii*), considered by some to be closely related to the heath family, grows well near-by.) Bearberry also grows well in the Rock Garden, where it almost completely covers large boulders. In addition, it is holding its own, in a specially prepared bed, in the planting described on pages 4 to 8 in this issue of PLANTS & GARDENS.

ORDINARY CONDITIONS FOR HEATH CULTURE

These conditions are explained in the articles on pages 16 and 27. Most of the plants in this group (all but four) either come from other parts of the world or (if native to this country) do not grow wild within 100 miles of Brooklyn, and so are not planted in the Wild Flower Section of the Garden.

Azaleas (*Rhododendron*) have grown most satisfactorily here, especially on Azalea Knoll, where they are shaded by a group of flourishing pin oaks whose fallen leaves provide a protective mulch around the azaleas.

Some of our readers may not understand the rhododendron-azalea situation. Nowadays, the genus *Rhododendron* is considered as including both rhododendrons and azaleas. The azaleas are mostly deciduous, shedding their leaves in the fall; while rhododendrons have leaves which are evergreen, i.e., persisting through the winter. Although this distinction is not an absolute one, it is generally true.

Following are a few of the azaleas that do well here:

- **Ghent hybrids**
  - **Daviesii**
  - **Nancy Waterer**
  - **Raphael de Smet**
  - and others
- **Kurume azaleas**
  - **Amoena** (*Rhododendron obtusum var. amoenum*), with flowers of a peculiar purplish color
  - **Hinodegiri,** with crimson flowers
  - **Torch azalea** (*Rhododendron obtusum var. Kaempferi*) orange-red to pink
- **Mollis hybrids,** many yellow-flowered
  - **Anthony Koster**
  - and others

Blueberries: the **highbush blueberry** (*Vaccinium corymbosum*), and the **black-fruited highbush blueberry** (*Vaccinium atrococcum*), formerly considered merely a variety of the common highbush, and

Bearberry fruits

McFarland photo

Louis Buhle photo

Bearberry growing over a boulder in the Rock Garden of the Brooklyn Botanic Garden

A large specimen of sour-wood

McFarland photo

possessing downier leaves and shining black berries. (See also "swamp plants.")

Enkianthus: the **red-vein Enkianthus** (*Enkianthus campanulatus*) has open, cup-shaped flowers. The **white Enkianthus** (*Enkianthus perulatus*) has urn-shaped flowers, somewhat of the blueberry type. Both kinds are natives of Japan, and deserve greater popularity with our gardeners. They are laden with flowers in early May.

Heath: the **Swiss heath** (*Erica carnea*) often blooms here in January. This is the true heath, from which the family derives its name; it has short, spreading, needle-like leaves. Heather (*Calluna*) has scale-like leaves, pressed close to the stem; but its flowers somewhat resemble those of the true heath. We have tried unsuccessfully to grow heather; perhaps our hot dry summers and cold winters, combined with the rather exposed location where these plants were set out, have been too much for them to endure. Certainly the climate is very different from that of its native Scotland and Ireland in the case of the heather, and of the Alps, for the Swiss heath.

Leucothoe: drooping leucothoe (*Leucothoe Catesbaei*), from the southern Appalachians, has long pointed evergreen leaves.

Mountain-laurel (*Kalmia latifolia*) grows in masses high up on a bank (see also "Plants of Sandy Woods").

Pieris: the American **mountain Pieris** (*Pieris floribunda*) has flowers of the blueberry type in erect clusters. The **Japanese Pieris** (*Pieris japonica*) has similar flowers in drooping clusters. Since the flowers are in bud all through the winter, these two kinds of Pieris can be readily distinguished at any time by this feature alone. The flowers of the Japanese Pieris are sometimes in bloom in Brooklyn in late March.

C. C. photo

Seed capsules ("fruits") of sour-wood

The beauty of rhododendrons reflected in the lake in the Brooklyn Botanic Garden

Louis Buhle photo

Rhododendrons: the **Carolina rhododendron** (*Rhododendron carolinianum*) with beautiful pale rosy-purple flowers; *Rhododendron mucronulatum*, with similar flowers, blooming profusely and very early (often in late March); and many other cultivated varieties and hybrids have thrived here for many years, growing under diverse conditions—some of them along the lake, as shown in the photograph.

Sheep-laurel (*Kalmia angustifolia*) has thrived here for many years (see also "Plants of Sandy Woods").

Sour-wood, or **sorrel-tree** (*Oxydendrum arboreum*), is native from Pennsylvania to Florida. Its leaves have an acid taste somewhat like that of sheep sorrel; they turn scarlet in the fall. At that time, with its long one-sided fruit clusters and its brilliant leaves, it is a conspicuous and handsome tree in the landscape. These forward-projecting fruit clusters call to mind the bangs of the Dutch maidens on the Island of Marken in Holland, bangs well waxed and projecting almost horizontally.

Sweet pepperbush (*Clethra alnifolia*), a heath relative, is often cultivated for its spikes of spicy white flowers in July (see also "Swamp Plants"), and does well under city conditions.

* * *

Heath in full bloom

McFarland photo

Louis Buhle photo

Exhibit at International Flower Show, 1947

WITHIN THE BROOKLYN BOTANIC GARDEN

FLOWER SHOW EXHIBIT

"Soils and Fertilizers" was the general theme of the Brooklyn Botanic Garden's exhibit at the International Flower Show in New York, March 17–22, 1947. In the center of the exhibit was a graphic illustration of the physical make-up of the soil, showing the seven constituents of a good soil: sand, clay, silt, organic matter, microorganisms, water with dissolved chemicals, and air.

Sprouting seeds in closed glass dishes were displayed under a magnifying glass so that the root hairs were visible—hairs through which plants take in water and nutrients from the soil. Young plants of corn, clover, and bean were displayed to show the extent of their root systems, both in depth and in branching.

The importance of soil aeration and drainage, as well as fertility, was illustrated by a series of tomato plants grown in tall glass jars. The different plants were grown in soils with high and low fertility, good and poor aeration, and good and poor drainage in various combinations. The plant in fertile soil with good drainage and good aeration grew best. The next best growth was secured in a fertile soil with good drainage but poor aeration. Poorer growth was shown by the plant in fertile soil with poor drainage as well as poor aeration.

In poor soil, even with good drainage and good aeration, the growth of the plant was still poorer than in any of those in fertile soils. The root system was extensive, but the top was short and stunted and had small leaves. The weakest growth of all occurred in poor soil with both faulty aeration and lack of drainage. Plants under such conditions are stunted and have small leaves, generally with a yellowish green color.

Another series of tomato plants was grown in jars of sand and "watered" with nutrient solutions. One solution was made with suitable proportions of all of the chemical elements necessary for growth; one with all but nitrogen; another with all but phosphorus; and a fourth with all but potassium. The plants watered with the "complete" solution grew vigorously, just as they would in fertile soil. Those that received the incomplete solutions showed signs of fertilizer deficiency just as would plants growing in soils poor in those particular elements. Plants which are deficient in any of the necessary chemical elements from the soil are poorer foods for either man or animal. Samples of the common fertilizers were displayed in the exhibit, together with their names and the material or materials they supply to the soil.

The most popular section of the exhibit was a demonstration of the steps in making compost, the return of dead plant material to the soil.

CONRAD B. LINK

FORSYTHIA DAY

Forsythia Day, now a fixture in the Garden's calendar, was observed with appropriate ceremonies on April 9. As is generally known, Forsythia is Brooklyn's official flower, chiefly through the efforts of Mrs. E. C. Blum of the Woman's Auxiliary of the Garden, who originated and promoted the idea, and Borough President Cashmore, who gave it official sanction.

In his proclamation on 1947 Forsythia Week in Brooklyn, Mr. Cashmore said that the flower signified "friendliness toward one's fellow men, the urge to be of greater service to one another and of understanding kindness. . . . It may well be that if enough people listen to the message of Brooklyn's official flower, the cause of world-wide peace will be advanced."

The exercises were held in the Auditorium, the principal speaker being Dr. John H. Lathrop, Pastor of the Unitarian Church of the Saviour, Brooklyn. The Right Rev. Edward P. Hoar, V. G., P. A., pronounced the invocation and Dr. Sidney S. Tedesche the benediction.

Other speakers were Mr. Leonard P. Moore, Chairman of the Botanic Garden Governing Board, Dr. George S. Avery, Jr., Director of the Garden, Mrs. Thomas H. Roulston, President of the Woman's Auxiliary, and Mrs. Blum.

Harp selections were played by Marcelle De Cray.

CONFERENCE ON THE CONTROL OF PLANTS HARMFUL AND ANNOYING TO MAN

In cooperation with the Department of Health of the City of New York, a conference was held at the Brooklyn Botanic Garden on April 16 to discuss ways and means to rid the country of poison ivy and sumac, ragweed, and other noxious plants.

At the morning session Dr. George S. Avery, Jr., Director of the Garden, and Dr. Conrad B. Link, Horticulturist, spoke on "New Methods of Weed Control." In the afternoon Dr. R. P. Wodehouse of the Lederle Laboratories spoke on "Plants and Allergies"; Alfred H. Fletcher, Director of the Bureau of Sanitary Engineering, Department of Health of the City of New York, discussed "Community Organization for Large-scale Control of Allergy-causing Plants"; and Mrs. James A. Funkhouser, President of the New Hampshire Federation of Garden Clubs, talked on "A Town with Poison Ivy Control." Mrs. Thomas H. Roulston presided at the morning session, Mr. Fletcher in the afternoon.

There was a large attendance, consisting of members of the Garden, delegates from Garden Clubs and other civic-minded organizations from New England, New York, New Jersey, and other near-by States, officials of Health Departments of towns and cities in the New York region, and many park officials.

BROOKLYN BOTANIC GARDEN
OF
THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES

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PLEASE

Back numbers of PLANTS & GARDENS

The unexpected demand, combined with the paper shortage, has led to the virtual extinction of the following issues:

Spring, 1945 (vol. 1, No. [illegible])
Winter, 1945 (vol. 1, No. 4)
Autumn, 1946 (vol. 2, No. 3)

Subscribers who are not keeping their back numbers indefinitely can do a real service to the many who wish to secure them. Send a postcard to PLANTS & GARDENS, saying which of the above issues you can spare. We will send a check (50 cents for each) and an envelope for mailing.

[If you are keeping all back numbers, binders are still available at $1 each, two for $1.50.]

TO VISITORS

To reach the Garden:

By Subway: **I. R. T. (West Side)** to Eastern Parkway-Brooklyn Museum Station; **I. R. T. (East Side)** to Nevins Street, step across platform and change to "New Lots Avenue" or "Flatbush Avenue" (West Side) train; **B. M. T.** Brighton Beach train to Prospect Park Station.

By Automobile: from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway; follow the Parkway to Washington Avenue, then turn right.

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Summer, 1947

Layout of the Small Place

—

Something about Perennials and how to Propagate them

—

Shrubs for Summer and Autumn Bloom

—

Lawns for the South

—

Cover Crops and Fertilizers

—

Virus Tumors in Plants

3 NEW SERIES NO. 2

AMONG THE CONTRIBUTORS TO THIS ISSUE

Frank Bailey is an amateur horticulturist and retired business man; for seven years a Trustee of the Botanic Garden, and Chairman of its Governing Committee from 1921 to 1926. He is the proud possessor of one of the show places in Locust Valley, Long Island—an arboretum in its own right.

Julia S. Berrall (Mrs. Lloyd) is an amateur gardener and garden lecturer. Her husband is an architect.

Elmer A. Claar of Chicago is an apartment hotel builder and manager, who, as an amateur gardener, has specialized in Hemerocallis.

Elizabeth Clarke is a Curatorial Assistant at the Brooklyn Botanic Garden.

Alexander Cumming, Jr., is the head of Bristol Nurseries, Bristol, Connecticut. He is especially famous as a breeder of chrysanthemums.

Arnold M. Davis is Director of the Cleveland Garden Center.

Frederick N. Evans was a landscape architect and Superintendent of Parks in Sacramento, California. His article appears posthumously.

George Graves is Horticulturist of the Massachusetts Horticultural Society and Associate Editor of *Horticulture*. He also conducts a daily radio program on horticultural subjects.

Esther Ann Huebner was formerly a member of the Brooklyn Botanic Garden Staff, and is now Head Gardener at The Cloisters in Fort Tryon Park, New York.

Dr. Sally Kelly is a Research Fellow at the Brooklyn Botanic Garden.

Dr. Conrad B. Link is Horticulturist at the Brooklyn Botanic Garden.

Frances M. Miner is Curator of Elementary Instruction at the Brooklyn Botanic Garden.

Agnes Tamm Nemiccolo (Mrs. A.) of Marlboro, Mass., was before her marriage a garden consultant in the Philadelphia suburbs and in Montclair, N. J.

Winton H. Reinsmith is a member of the U. S. Forest Service and specialist in grasses for the South.

Paul Schmidt is a florist of Youngstown, Ohio, who has done more than anyone else to improve Buddleia.

Margaretta Duane Wood (Mrs. Richard D., Jr.), an amateur gardener of Wawa, Pa., has been successful in growing prize-winning clematis.

PLANTS & GARDENS

Louis Buhle photo

Spring Adonis (*Adonis vernalis*)

New Series Summer, 1947 Vol. 3—No. 2

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JOHN C. WISTER, *Editor*

Michalena L. Carroll and Hester M. Rusk, *Assistant Editors*

Except where otherwise credited, drawings by Michalena L. Carroll

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Louis Buh

Trees Mirrored in Lake in Brooklyn Botanic Garden

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Summer, 1947

A survey of the summer garden is in order at this season; and Editor Wister has assembled a battery of experienced gardeners to make suggestions on choice of material for another year. While the successes and failures of this year's garden are still before you, get ready for next year.

Two or three times each year we try to bring you a popular account of some significant research on plants. In this number is an article about virus tumors in plants, presenting some of the discoveries made by our own researchers. As you read it, you will find that the problem of tumors in plants comes very close to that of human cancer.

This summer we have frequently been asked whether we recommend the use of 2-4-D weed killer for lawns -- either in dust form, or dust in combination with fertilizer. Where new horticultural practices are involved, we offer no recommendations until after tests have been made here at the Garden. In the case of 2-4-D dusts, we do not know the answer as yet.

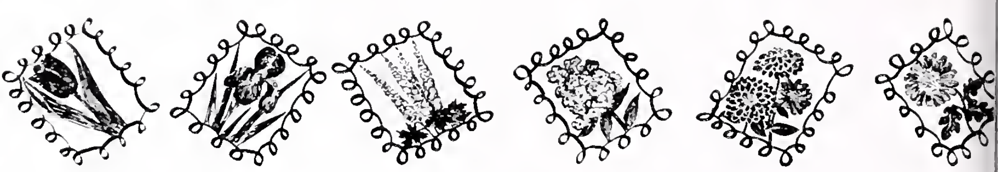
If you are experimenting with 2-4-D dusts this summer, do so with much caution. We find that 2-4-D dust, alone or in combination with a fertilizer, will kill a number of the troublesome broad-leaved lawn weeds. But we find also that the slightest wind will carry this dust to vegetables or flowers growing nearby and cause injury to sensitive plants - and most plants are sensitive.

Thank you for your letters about the spring issue. Your appreciation helps us to give you better things.

Yours sincerely,

George S. Avery Jr.

Director



GARDEN COLOR SCHEMES

A succession of them provides a series of garden pictures

Julia S. Berrall

A GARDEN is a dramatic thing; and like all good dramas, it should have a setting. Away with all so-called beds of this, that, and the other, carving up the lawn! Give a garden background: a fence, a shrub border, or both, will give a feeling of stability and permanence; and the foliage of the shrubs will provide a restful green screen against which to present the flowers. The use of many white flowers will bring out the other colors by contrast, and yet blend everything into a lovely whole. I have no room for red, magenta, or orange—with one exception, *Lilium umbellatum.* There are too many beautiful shades of rose and pink with which they can clash. Instead of being a melee of color, the garden is more interesting if it has certain definite combinations of colors at varying times. In this way one has vivid garden pictures to enjoy while the season is on, and to recall out of season.

I have worked out a continuous succession of bloom in my garden by planting ten large groups of tulip bulbs over which I plant zinnias and marigolds later. Practically all the rest of the garden area is given over to perennials. All the shrubs are flowering.

Tulip picture

The garden season begins flamboyantly the second week of May. (The locale is northern New Jersey.) Darwin and cottage tulips make bold chunks of color throughout the border. There are combinations of purple, salmon, and yellow; yellow, bronze, and peach-orange. The bright rose of King George is set off by early purple and bluish-white Florentine iris. The background includes a pink hawthorn, and lilacs of purple, blue, pink, and white. The whole effect is striking and gay. By the time the tulips are at their height six bushes of "bridal wreath" (*Spiraea Vanhouttei*) provide waterfalls of foaming white behind them.

Iris and Delphinium Pictures

The fascinating part of gardening is watching one picture fade out and another arrive. There is a moment of breathless anticipation before the outlines of each new picture are clearly defined. Almost before we are aware of the change, the tulips are gone and iris is here. The pattern is changed to one of lovely pastels and deep purples, intermingled with the clear yellow of lemon-lilies. Gradually purple and white Siberian iris and salmon-pink Oriental poppies appear among the rest. Then the scene is shifted once more, this time to a definite color scheme of purple, blue, orange, yellow, and white: the yellows of tall *Thermopsis,* dusty meadow-rue (*Thalictrum glaucum*), and evening-primrose; the blues of delphinium and Italian bugloss (*Anchusa azurea* Dropmore); the purple of the bellflower (*Campanula glomerata*); the orange of *Lilium umbellatum;* and the many whites, including mock-orange (*Philadelphus*), make up this striking ensemble.

The delphiniums, if not allowed to go to seed, bloom a long time; and their blues are soon supported by speedwell (*Veronica spicata*). This latter will bloom continuously all summer long, if the old flower heads are cut off; and the same treatment brings a second flowering of phlox. Phlox Miss Lingard lasts well, and Shasta daisies continue the white that Japanese iris and madonna lilies have previously provided. As the last of the primroses fade, the pink phlox is coming into bloom. There are always moments of suspense when the pink is entering the scene, for the orange lilies must be through blooming first. However, any pink blossoms that come too early may be snipped off for indoor bouquets. By the fence there are now hollyhocks and white perennial peas (*Lathyrus latifolius*).

There is always a variety of small flowers growing amongst these bold groups; and these, while not taking part in the actual color scheme, provide bits of interest for one who is making a close inspection of the garden. Blue phlox (*Phlox divaricata*), Johnny-jump-ups, coral-bells (*Heuchera sanguinea*), columbine, old-fashioned garden heliotrope, forget-me-nots, violas, pinks, and bleeding-heart are among these.

Phlox and Zinnia Pictures

July is the month for phlox; and I have gathered together many beautiful shades of rose and salmon-pink, and of course plenty of white. Other color is given by lavender balloon-flower (*Platycodon*) and whatever small annuals I have chosen for edging or for filling empty places. Sweet alyssum and ageratum have been the most satisfactory plants for bordering. The shrubs in the background consist of three deep purple butterfly-bushes (*Buddleia*), one gorgeous blue chaste-tree (*Vitex*), three fragrant sweet pepperbushes (*Clethra*),

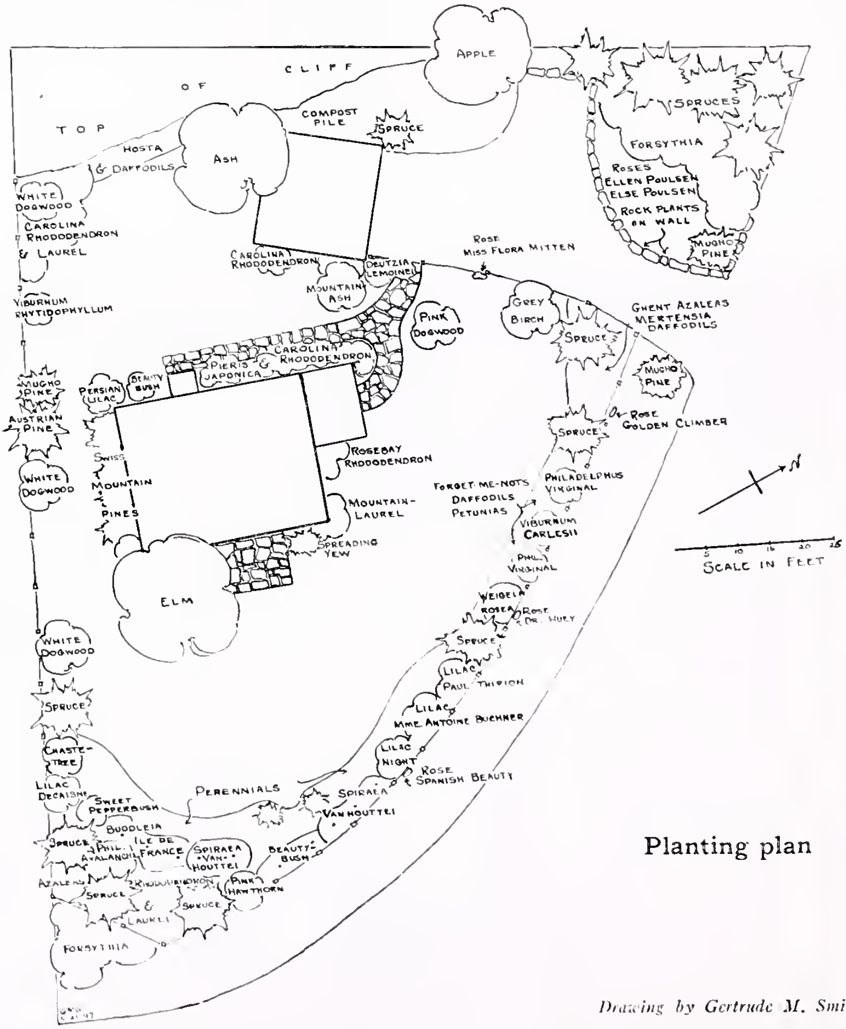
Madonna lilies (*Lilium candidum*), a mass of white

McFarland photo

two shell-pink mallows, and two white mallows. As the zinnias (rose, salmon, pale yellow, flesh, and white) and the Yellow Supreme marigolds start blooming, the garden may be said to be at its full height. The satisfying thing now (after all the busy weeks of spring planting) is the fact that this lushness lasts a long time. August and early September add blue eupatorium and hardy asters, but the pink phlox has vanished.

Chrysanthemum Picture

As soon as the annuals are nipped by the cold, they are removed. Their dilapidated appearance ruins the garden's last days, and the chrysanthemums should have the stage all to themselves for the finale. October is of course their month. Their beauty and hardiness are most satisfying; and I feel regretful each year that there was not room for more. I have seven clumps of these, each a different shade of bronze, rosy rust, yellow, or dusty pink, or white. Any chrysanthemums would blend with the autumn foliage, but mine are definitely chosen to provide cut flowers for the house. They stand, lone sentinels of the garden, after everything else has been bowed down by frost.



Planting plan

Drawing by Gertrude M. Smith

SHRUBS FOR SUMMER AND AUTUMN BLOOM

Many kinds and sizes for various situations and uses

George Graves

A QUICK check of the list of garden-worthy shrubs reveals a rather surprising number that open their flowers after the highly competitive color show of April to June has passed. As single species or in variety, these late-blooming plants—big and little—can be worked into plantings to extend the blooming season.

Acid-soil Shrubs

One of the earliest of this miscellaneous assortment of tardy-flowering plants is a native azalea usually referred to as white swamp honeysuckle (*Rhododendron viscosum*). Unlike those of most of the summer shrubs, its white flowers open from buds which have spent the winter in place on twigs of the previous year's growth. It is a shade-tolerant plant of moist thickets, where its presence is usually detected by its spicy, pervading fragrance. As for appearance under such conditions, the competition of such plants as blueberry, sweet pepperbush, and black chokeberry usually forces it up into a tall, gaunt plant. In a garden free from crowding, it makes a more symmetrical plant; but even so, its most satisfactory planting use seems to be as something to be enjoyed by the sense of smell rather than that of sight.

The shade-tolerant sweet pepperbush (*Clethra alnifolia*), from the same moist, acid-soil, wild sites, has more to offer in the way of garden value. It is a plant

Sprig of heather (*Calluna vulgaris*)

McFarland photo

McFarland photo

Hydrangea (*Hydrangea arborescens* var. *grandiflora*) of upright habit, with shining foliage which turns yellow in autumn. Upright, too, are its long clusters of fragrant, white flowers in July and August. Later, these flower clusters develop into attractive subjects for the "dry" bouquets of early winter. A variety with red-pink blossoms is sometimes grown. Two other species are also grown in some gardens: the cinnamon clethra (*Clethra acuminata*) is favored because of larger flowers; the Japanese clethra (*Clethra barbinervis*) can grow into a 40-foot tree.

A top-tender plant which blooms from June until frost is the Irish-heath (*Daboecia cantabrica*). It is of small stature, and is probably of interest only to rock gardeners who provide it with a sandy-peaty spot in which to grow.

A far more usable plant for mass setting in sandy-peaty soil is the heather (*Calluna vulgaris*), now available in numerous clonal forms. These forms are based on differences in color, such as white, pink, or red; or on growth habit, such as relatively tall or low-growing, and upright or spreading. One thing to watch for and guard against, when named varieties of heather are planted, is volunteer seedlings coming up, which would stifle the older plants and turn the planting into a crowded group of ordinary purple-flowered plants. Also, for neater effect bank plantings of heather should be pruned to the base in the spring every year or so.

Still another acid-soil, native plant which appears among the blueberries and wild roses in eastern pastures is the sheep-laurel, or lambkill (*Kalmia angustifolia*). For gardens near the sea, or for bank plantings along roadsides, the somewhat variable color of its midsummer, reddish flowers can be of value. Freed from competition with other plants, it rounds out in habit to a height of 2 feet.

Top-tender Shrubs

Several late-blooming shrubs of less importance fall in what has come to be known as the "dieback" class: that is, the roots live over but the tops are frozen

Spike broom (*Cytisus nigricans*), a low shrub

Louis Buhle photo

McFarland photo

Flowering branches of bluebeard (*Caryopteris incana*)

to the ground in most winters. The spike broom (*Cytisus nigricans*) is such a plant. It can grow up from ground level to a height of 3 feet or so, and terminate its stems with long clusters of yellow, pea-like flowers in July and August. Blooming somewhat later is *Elsholtzia Stauntonii,* which tops off its 2-foot vertical stems with one-sided spikes of lilac-purple flowers. Still another of these lesser dieback plants is *Fuchsia magellanica* var. *Riccartonii,* which (where hardy) will grow into a 3-foot plant bearing countless hanging, red-and-purple flowers. None of these three plants is particularly significant as far as gardens are concerned; but they can often be fitted into the back of a flower border or into bays in large shrubberies. Also for the herbaceous border is the bluebeard (*Caryopteris incana*), which can grow up from the roots to as much as 2 feet in height, and bear lavender-blue flowers in late summer.

Another dieback shrub of considerably more importance, the chaste-tree (*Vitex Agnus-castus*), is available in three flower colors: violet, white, and pink. The variety most commonly grown is *Vitex Agnus-castus* var. *latifolia,* which is hardier and more vigorous in growth, and has broader leaves. This is the *Vitex macrophylla* of many nursery catalogues. Vitex is usually frozen to the ground every winter, and, like the butterfly-bush, is the better for it. This pruning by cold weather causes the formation of well-rounded, 3- to 5-foot plants which bear dense clusters of fragrant blossoms in late summer.

Perhaps the toughest and most vigorous of the dieback shrubs is the purple-flowered bush-clover (*Lespedeza Thunbergii*), which was so much used in older gardens under the name of *Desmodium penduliflorum.* The rosy-purple flowers which terminate the gracefully drooping branches of herbaceous aspect come very late in the season. This is one of the few dieback plants that can be satisfactorily fitted into large shrubberies. The facts that it throws up many 5-foot stems and has a pleasant habit have led to its being used for unpruned hedges. The somewhat earlier-blooming *Lespedeza bicolor* is less attractive because of its erect habit of growth.

Some of the late-flowering plants are more or less continuously in bloom, once blooming starts. Such a plant is the glossy abelia (*Abelia grandiflora*), a plant of garden origin, the hardiest of the genus. This shade-tolerant, half-evergreen shrub can grow (where the winters are not too severe) into a well-rounded bush some 3 to 5 feet in height. From June to November it is covered with white or pinkish-white flowers which fall away, leaving a show of purplish sepals.

Hydrangeas

The hydrangeas form one of the more important groups of summer-flowering shrubs; the panicle hydrangea (*H. paniculata*) and its varieties are suitable over the widest area. A few years ago the so-called Peegee variety, in which the entire flower head is composed of sterile flowers, was almost the only form available. But now the type, with its August-borne clusters, more open because both sterile and fertile flowers are present, is coming to be appreciated. Also, there is an earlier-blooming variety, *Hydrangea paniculata* var. *praecox*. This species thrives, as do other hydrangeas, when plenty of moisture is available during the growing season. While the plant can develop tree-like proportions if left unpruned, the usual custom has been to prune severely each spring to induce the formation of fewer but larger flower clusters.

The variety known as Hills-of-Snow (*Hydrangea arborescens* var. *grandiflora*) is of considerably smaller stature and seems to be able to grow in poor, dry soil. Also, it will withstand a considerable amount of shade. The shoots are terminated in mid-July by white heads on which all of the flowers are sterile and showy. The type plant, *Hydrangea arborescens*, has both kinds of flowers in its cluster.

Among the showiest plants in late-summer seaport gardens along the Atlantic coast from New England south are the blue and pink hydrangeas, such as those which florists force in pots. The blue coloring is brought about by the presence in the soil of aluminum, or conditions of soil acidity which make it available. Of late years, there has been a move away from the florists' kinds, with all flowers sterile, to those such as

Hydrangea (*Hydrangea paniculata*)

McFarland photo

McFarland ph

Flowers and foliage of shrub-althea (*Hibiscus syriacus*)

Hydrangea macrophylla var. *caerulea*, which has large heads of deep blue fertile blossoms ringed around with lighter blue sterile ones.

Shrub-althea

For variety among the late-blooming shrubs or small trees, there is the shrub-althea, or rose-of-Sharon (*Hibiscus syriacus*), which has probably been in cultivation as long as any other common woody plant. It is a gray-barked, Asiatic plant which grows rapidly while young but more slowly upon attaining some age. This characteristic is significant as far as the culture of the shrub-althea in northern gardens is concerned. When very young plants are set out to brave the low temperatures of northern winters, the result is usually serious killing back. On the other hand, when plants which have been grown to some size and heaviness of wood in southern nurseries are set in the North with little or no pruning, such injury either fails to result or is superficial in effect because the plant blooms on new wood. When pruning in practiced, it should be thinning by cutting above side branches rather than shearing to harsh outlines.

Ancient advice (imported with the plants from Europe) is that the shrub-althea should be set in a very dry place. Experience has shown that this advice is unsound and that good growing conditions are what it needs in this country. Even so, the plants seems to do well in city gardens.

Another growth peculiarity is that the leaf buds open very late, long after those of other woody plants. This behavior has often led gardeners with little patience to give up as dead a very much alive, newly set plant, and to complain to the nurseryman who sold it.

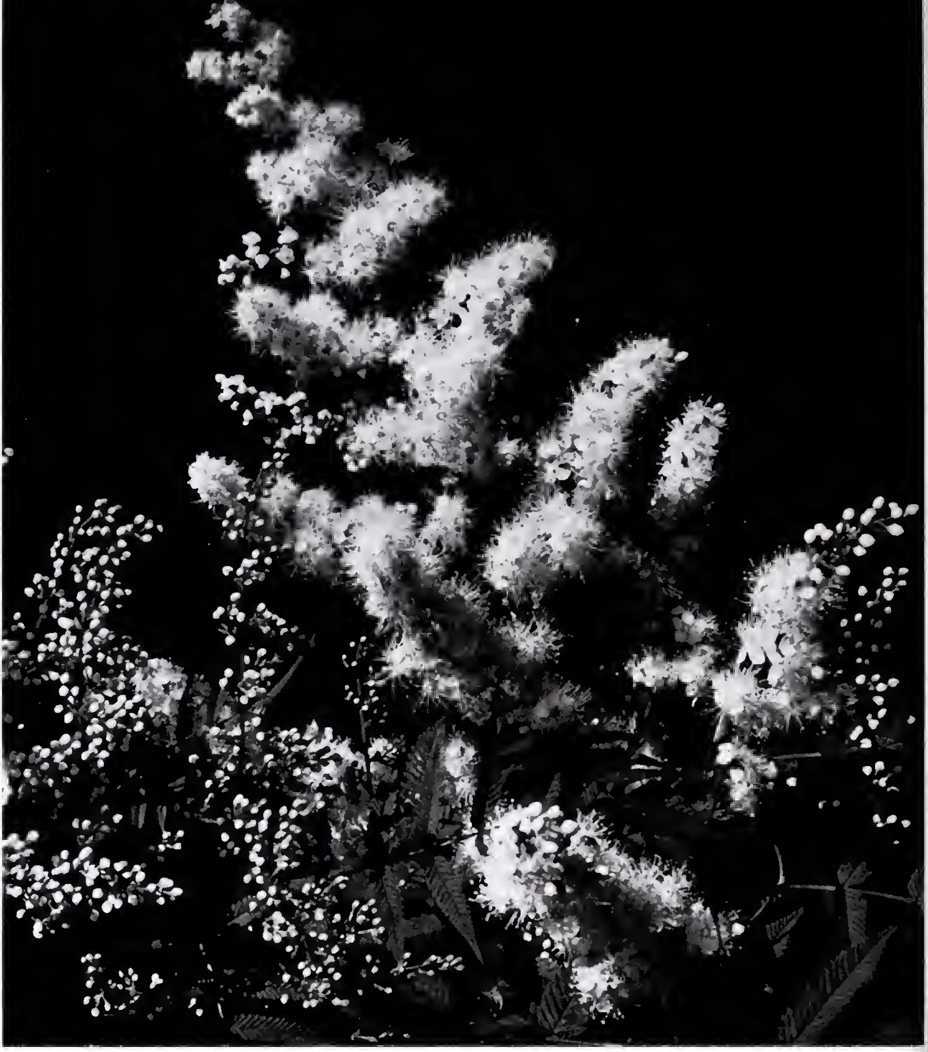
The flowers of the shrub-althea are hollyhock-like in the single varieties. There are also double-flowered varieties, and one with variegated foliage. The most common shrub-althea flower seems to be single in form and purple in color. Other varieties are: Ardens, double lavender-violet; Boule de Feu, double violet-red; Banner, double white and crimson; Coelestis (Celeste), single blue with dark center; Duc de Brabant, double red; Jeanne d'Arc, double white; Lucy, semidouble pinkish; Ruber, single red; and Totus Albus (Snowdrift or Snowstorm), single pure white.

Shrubs for Various Uses

There are two false-spireas which can be grown where there is room enough for very large shrubs: *Sorbaria Aitchisonii* grows to be 10 feet high, displaying large clusters of small, white blossoms in July; *Sorbaria sorbifolia* is somewhat less lusty in growth but is of the same general habit, although its flowers may open a little earlier. Where rose bugs abound, these coarse white-flowered plants attract those insects from the blossoms of more favored garden plants.

Chaste-tree (*Vitex Agnus-castus*), a generous-sized shrub

Louis Buhle photo



McFarland photo

Flowering branch of false-spirea (*Sorbaria sorbifolia*), a large shrub

In older gardens the crimson-flowered *Spiraea Bumalda* Anthony Waterer was much planted in groupings, and sometimes as a hedge plant. Left unsheared, plants of this variety usually stand 2 to 3 feet in height and bear their flat flower clusters in midsummer. However, if the flowers are removed at the fading stage, a second blooming may often be had the same summer.

A shrub for seashore planting but never one of neat appearance is the so-called five-stamen tamarisk (*Tamarix pentandra*). It has a definite exotic aspect because of its plumy foliage made up of fine, scale-like leaves, and its flopping branches. In this species the young branches are purple in color. The pink flowers appear in large branching clusters in mid-July.

Among the amorphas, perhaps the species most suitable for gardens is the lead-plant (*Amorpha canescens*). It does not grow so tall as some of the others, being restricted to a rounded, 4-foot plant covered with white hairy leaves. It terminates its branches with 6-inch spikes of blue flowers somewhat after midsummer. This plant can send down deep roots which permit survival in very sandy soils or during periods of extreme drought.

The St. Johnsworts have something to offer in addition to yellow flowers in summer. They are shade-tolerant; and this characteristic leads to the frequent use of one species, *Hypericum calycinum*, with its foot-high stature and evergreen foliage, as a ground cover. *Hypericum frondosum* develops into a neat 4-foot shrub which can thrive in dry soils and bloom in late July. It often selfsows, as do some others of this group, to the point where it can be classed as a weed. *Hypericum Kalmianum* is sometimes used as a 3-foot hedge which needs little or no pruning.

For gardens to the south, an important summer-blooming shrub is the crape-myrtle (*Lagerstroemia indica*). This 20-foot shrub with privet-like leaves ends its growth shoots with crinkled-petaled flowers which may be white, purple, pink, or red, depending on the variety. By moving in large plants and giving them no pruning, one can sometimes make the crape-myrtle establish itself in gardens north of its usual range.

The bottlebrush buckeye (*Aesculus parviflora*) is a shade-tolerant American plant which was formerly much used as a lawn specimen or as underplanting in thinly wooded park areas. For best results moist, loamy soil is called for. So planted, this shrubby horse-chestnut will become a broad spreading plant from 3 to 10 feet in height. In July or early August it will bear its white flowers in erect, slender clusters.

Although of little garden value, the native (dwarf) bush-honeysuckle (*Diervilla Lonicera*) can be planted to advantage on large, dry banks or rocky roadside areas. Its yellow, summer flowers are borne on plants of herbaceous aspect and some 2 or 3 feet in height. Grosser in every respect is *Diervilla sessilifolia* of the upper South.

The last of the shrubs to bloom is the native witch-hazel (*Hamamelis virginiana*), which unfolds its yellow blossoms during warm October and November days. It is not a particularly suitable garden plant, but is more suited to the edges of woodlands or to the roadside. Strangely enough, the more showy spring-blooming witch-hazels are prone to bloom regularly in autumn in some parts of the coastal area of New England. However, this behavior cannot be depended upon elsewhere.

Bottlebrush buckeye (*Aesculus parviflora*), a large spreading shrub *Louis Buhle photo*

ROMANCE OF THE FRANKLIN TREE

Advice of one who grows it: "Be sure to plant one!"

Frank Bailey

THE Franklin tree (*Franklinia alatamaha* or *Gordonia alatamaha*) was discovered in 1765 by the famous botanists, John and William Bartram of Philadelphia. The Bartrams were recognized, especially by Linnaeus, as great botanists. Kenneth Roberts, in his book "Lydia Bailey," tells a good deal about them. The story is that they discovered the tree growing near the Altamaha (or Alatamaha) River in Georgia. In 1773 William Bartram returned to Georgia to collect seeds. The tree was named in honor of Benjamin Franklin and the river near which it was found. According to the records, it was seen several times by interested botanists; but apparently it has long since entirely disappeared from the wild. *Franklinia* was referred to in "The Universal Herbal," published in London in 1824. But the tree has been comparatively rare. About thirty years ago it began to receive attention, perhaps through publicity about a specimen in Bartram's Garden which had become a part of Fairmount Park, Philadelphia. Nurserymen started propagating it, both by layers and by cuttings (layering is the only method by which I have been able to propagate it).

I obtained three plants about thirty years ago. One died, and two were planted on my place at Locust Valley, Long Island. They were set 50 feet apart with the same surroundings, the same protection, and the same soil. One is now 6 feet high, and the other is 32 feet high with a spread of 30 feet. I doubt if there are any other Franklin trees in the neighborhood as large as this. Those I have propagated from the big tree are growing as if they also would become large; one is at least 15 feet high now.

My largest tree was planted with the northerly protection of some white pines, in soil which is rather heavy for Long Island; and the tree has never been disturbed. It starts blossoming in August, and continues until frost; it has had as many as 1000 flowers in one season. It is practically the only important tree that blossoms in the fall. It never seeds in Locust Valley because of the frost. In the winter the striped bark is very interesting.

The description of the tree I boldly take from Bailey's "Cyclopedia of Horticulture":

> Shrub or tree to 30 feet: leaves obovate-oblong, narrowed into a short petiole, sparingly serrate, bright green and shining above, pubescent below, turning scarlet in fall, 5–6 inches long: flowers short-pedicelled, pure white, about 3 inches across; petals roundish obovate, with crenulate margin, concave: capsule globular, September, October. Georgia, but not found again since 1790.

The meanings of many of the terms used in the description are unknown to me; but that will afford the reader an opportunity to look them up in the dictionary.

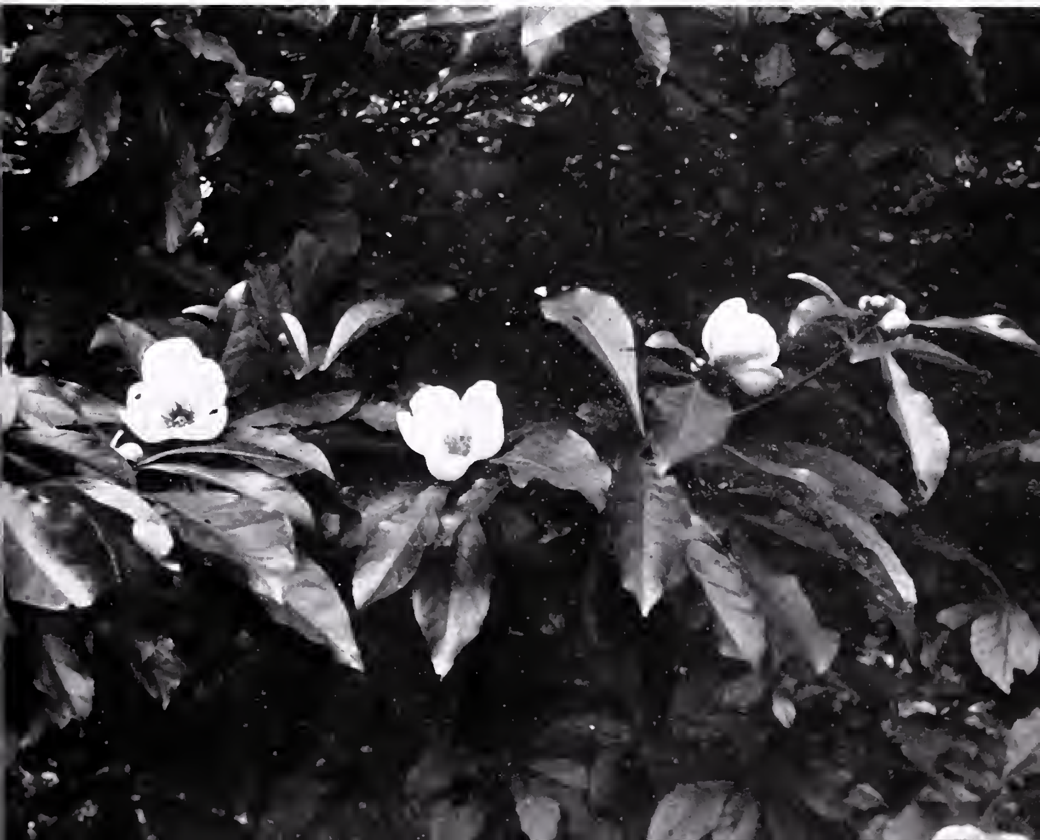
Apparently an acid soil is of advantage to this tree. In December 1945, Roy M. Nordeen, propagator of the Morton Arboretum, gathered some *Franklinia* seeds in the Hemlock Arboretum; he sowed them in 7-inch pots in May 1946. In February 1947, the seedlings were planted in two types of soil: one only slightly acid, and the other a black sedge peat, strongly acid. A month or so after transplanting, the seedlings in the slightly acid soil began to turn yellow, Mr. Nordeen reports, while the seedlings in the decidedly acid soil were very healthy.

The tree does not require any special watering; but if the season were especially dry, a little water would not be amiss. It is reported to be hardy as far north as Massachusetts, with a little protection. It has never "burned" in the cold weather since I have had it; and therefore I can see no reason why it should not be much more generally planted. It is true that only a small percentage of the nurserymen have it in stock; but that is usually the trouble with most of the newer and nicer plants.

Someday somebody is going to put into a book a list of trees and shrubs which should not be planted as well as those that should be. At the top of the list of those that should be planted I would put *Franklinia alatamaha.*

Flowering branch of Franklinia, blooming in late summer and autumn

Photo courtesy of Edgar T. Wherry



BUDDLEIA

Origin of the plant, its names and its varieties

John C. Wister

IT is a long journey from the discovery of a wild plant to its cultivation in gardens, and a still longer one in time before plant breeders begin to use the wild plant as a parent of improved varieties.

An excellent example of this is our popular summer-blooming shrub, the butterfly-bush, perhaps even better known as Buddleia. Linnaeus named the genus in 1737. It is said that Armand David, the French Jesuit priest and plant explorer, discovered a species of Buddleia in China and introduced it to the Paris Museum of Natural History before 1890. The plant is also said to have been introduced by Augustine Henry. But whichever is correct, it is this species which the botanist Franchet named *Buddleia Davidii* in 1887; and which the botanist Hemsley, apparently unaware of this fact, named *Buddleia variabilis* in 1889 because it was so variable in nature. The plant was known by this latter name until very recently, when the priority of the name *Davidii* was established. These early historical facts are all that interest the botanist, about this species.

The gardener, however, is interested in the later history of the plant. The first plant to be introduced was not of great beauty and was not taken up by nurserymen. To gardeners, therefore, it is important that the French explorer Jean André Soulie, in 1893, sent seeds to Vilmorin-Andrieux & Company in France. Some plants from this introduction may still be in cultivation. It is even more important to the gardener, that Wilson, about 1903, introduced a similar form from China to the Veitch nursery in England. Wilson's forms were identified in 1905 and were named *Buddleia Davidii* var. *magnifica* and *Buddleia Davidii* var. *Veitchiana*. Later *Buddleia Davidii* var. *superba* was added to these.

These three were beautiful garden plants and immediately became very popular. In the mild climate of England and France they grew pretty large; and after the siege of Verdun in the First World War Buddleias seeded themselves so extensively in the ruins that they became known in France as "The Flower of the Ruins" (La Fleur des Ruines).

It is a pity that the name given by the botanist Hemsley, *Buddleia variabilis*, could not be kept, as it describes a species which varies greatly. Many persons in Europe and America have grown seedlings; a number of these have been named. The first of these perhaps was Amplissima, which was introduced by Victor Lemoine & Son of Nancy, France, in 1911. Then came Ile de France, raised by that great French nurseryman and plant breeder, August Nonin of Chatillon near Paris. Several American nurseries introduced named varieties after 1938.

The greatest work in the development of the plant, however, has been done by Paul Schmidt, a florist of Youngstown, Ohio. It is, therefore, a privilege to be able to present herewith some notes written by him especially for PLANTS & GARDENS.

BUDDLEIAS OF 1947

Comparison with those of twenty years ago

Paul Schmidt

THE older varieties of Buddleia, such as Magnifica, Farquhari, and Ile de France, have been sold by the millions for landscape work all over this country for the last twenty years, and are still featured by many catalogs today. This popularity is deserved because Buddleias will grow in almost any type of soil and will survive many years. Even if they are cut down to the ground by a severe winter, they will come up

Buddleia "Fascinating" (*Buddleia Davidii* hybrid)

McFarland photo

quickly in a few months and flower in July and August. In many parts of the country they continue to bloom from July until frost.

Buddleias are cooperative plants and will readily repay good manuring or fertilizing. The plants need no spraying, as they are almost insect-free, and apparently are not susceptible to fungus diseases. In dry, southern climates red spider may be troublesome; but it can be easily controlled by a 2 per cent oil emulsion, with ½ ounce of Black Leaf 40 added to each gallon of spray. The plants grow readily in almost any situation; but they should be given full sunlight. The old canes should not be cut off until spring. Some gardeners prefer to cut the plants down to the ground, to make them lower and better balanced. A severe winter often relieves the gardener of this work.

The old-time varieties, which were so popular, had certain definite faults. Some of them grew too tall for garden work, even up to 12 or 15 feet in height. In warmer climates the earliest flowers to open on the spikes quickly burned in the sun and turned brown, making the whole spike unsightly shortly after it opened. The flowers did not last long in water, yet they were much desired for cutting because they were so beautiful.

Improvement by Breeding

About twenty years ago I set out to correct some of these faults. It took ten years of continual hybridizing to get my first hybrid. I named it "Fortune" because a small fortune was needed to make its development possible. It was introduced in 1936 and patented by Wayside Gardens. In Ohio this plant has a neat habit, grows about 4 feet tall, with a spread of about 4 feet, and has no rough growing characteristics. The foliage is a deep leathery dark green; the flowers, lilac with an orange eye. The spray is 12 to 15 inches long; and both summer and autumn blossoms are fully formed, and are in bloom from base to tip at one time.

After this variety was secured, it became easier to produce other good ones; and within a few years the following were introduced:

Concord (1939): the flower opens the color of Concord grapes, and changes to dark red.

Dubonnet: color, the dark purple of Dubonnet wine.

Eleanor (1939): large eye; does not sunburn; plant 2½ to 3 feet.

Orchid Beauty (1940): particularly long, tapering spikes.

Fascinating (1942): a soft orchid-pink.

Flaming Violet (1942): an arresting purple, the most brilliant of all.

Purple Prince: with a golden eye instead of the usual orange one.

Peace: an almost perfect white.

These varieties not only give a wider range of color than had existed before, but they are free from the worst faults of the older kinds. The plants are lower, heavier-foliaged, and stronger-stemmed; and they continue in bloom a much longer time, with a heavy production of flowering spikes throughout the season. All these varieties can be used for cut flowers and are now sold for this purpose by florists all over the country. The flowers may be cut in bud and will open in water without burned blossoms at the bottom.

I am still working to create new colors which do not now exist; and I have several interesting forms which are being tested and which I hope will be placed on the market within the next few years. Plant breeding is a fascinating work; and I think that I have been exceptionally fortunate in choosing this beautiful shrub, which can be put to many uses in the garden and can also be used for cut flowers.

COVER CROPS AND HOME FERTILIZERS

Suggestions on fall treatment of the soil

Conrad B. Link

SUMMER is the time to plan for soil improvement operations which are to be carried out in the fall. New areas may be prepared for planting or old ones improved. More attention can be given to such jobs in late summer or fall when other garden work is less urgent.

Cover Crops

In preparing soil for planting, one of the most important things is to provide organic matter. In large areas where planning and preparation can be done months in advance, the use of cover crops or green manure crops is an effective way of increasing the organic matter in the soil. According to the time of planting and the time of plowing under, such plants may be divided into two groups: summer and winter cover crops. Summer cover crops are planted early, and plowed under later in the same season. Winter green manure crops are planted in late summer or fall, and plowed under the following spring.

The best winter cover crops are rye, wheat, and rye-grass. Any of these may be sown from mid-August to mid-September. These crops will become well established before cold weather begins. During the winter they serve to hold the soil in place, and thus prevent erosion. All of them have large fibrous root systems which add extra organic matter to the soil when they are plowed or spaded under. They should be plowed under in the spring before they make much growth, usually by May 1. Winter vetch is sometimes used with rye, but the mixture must be left growing longer in the spring, to give full benefit. Rye-grass provides an excellent cover for the soil during the winter and an abundance of organic matter when plowed or spaded under; it has a particularly large root system. It is not so coarse as rye or wheat, and has a darker green color. It is especially useful when it is sown in the vegetable or cutting garden in late August or September. Seed can be scattered between the rows, and the rye-grass will not interfere with the maturing of the plants already there.

Summer cover crops are particularly suitable for areas to be made into lawn. Soybeans, oats, millet, and Sudan-grass are useful for this purpose, and may be sown in the spring and plowed under in the late summer or fall. These plants are ready to be turned under by mid-August or early September, in time for fall lawn making.

Buckwheat is another crop sometimes used to provide organic matter. It may be sown any time from June to late summer, and is usually plowed under while it is in bloom. It is killed by cold weather; but it may be left on the ground all winter and plowed under in the spring.

It returns to the soil the least amount of organic matter of all the crops mentioned here; but it has the advantage of being able to grow on rather poor soil. It shades out weeds fully as successfully as any of the pre-lawn crops, and is easily spaded under.

In large areas being prepared for planting, fertilizer should be applied to the soil before green manure crops are sown. The cover crop will be stimulated in growth by such fertilization, and will eventually add more organic matter to the soil as a result of it.

CROPS FOR GREEN MANURES

Suggestions for northern United States

Crop	Date of Seeding	Rate per 1000 sq. ft.	Time of plowing under
Summer crops			
Buckwheat	June to Sept. 1	2–2½ lb.	Aug.-Oct.
Millet	May 20 to June 10	6 oz.	Aug. 15-Sept. 15
Oats	March 15 to May 1	2 lb.	May 15-June
Soybeans	May 15 to June 15	2 lb.	Aug. 15-Sept. 1
Sudan-grass	May 20 to June 20	8 to 10 oz.	August
Winter crops			
Rye	Aug. 15 to Sept. 15	2½ lb.	April
Rye-grass	Aug. 15 to Sept. 15	½ to 1 lb.	April
Wheat	Aug. 15 to Sept. 15	2½ lb.	April

Organic Matter and Fertilizers

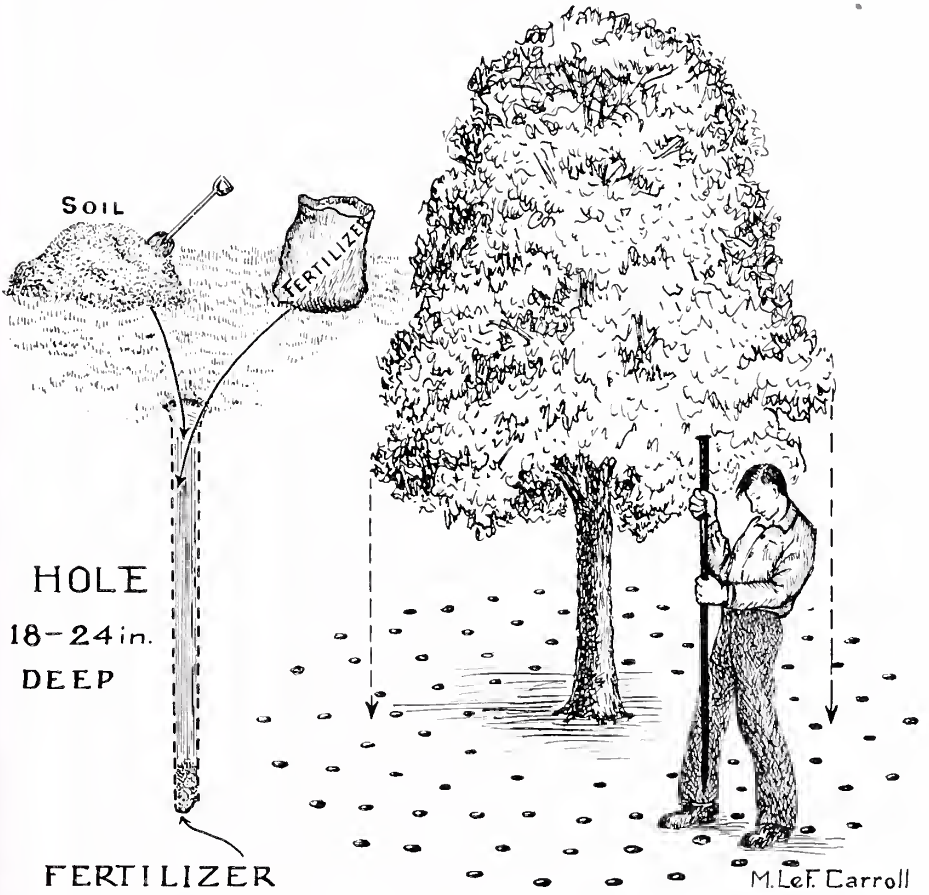
In small areas where cover crops are not practical, organic matter should be applied in the form of well rotted manure, leaf mold, peat, or compost. A medium application of such material is about 3 bushels to 100 square feet. It should be spaded in in the fall if planting is done at that time; or it may be left on the surface all winter and spaded under in the spring. Areas being prepared for shrub or perennial planting in the fall should have some fertilizer in addition to the organic matter. Superphosphate or bone meal may be used at the rate of 5 to 10 pounds per 100 square feet, and should be thoroughly incorporated into the soil. On light, well drained soils an application of potash (potassium) is desirable, such as muriate of potash at the rate of 5 pounds to 100 square feet. Heavier soils such as clay generally have sufficient potash for the growth of plants. Nitrogen is not needed in the fall of the year. At that season it is well to use a complete fertilizer which is low in nitrogen and high in phosphorus and potassium, such as 2–10–10; this is used at the rate of 4 to 5 pounds per 100 square feet.

Trees

Trees may be fertilized in the fall after growth has stopped for the season, usually October 1 or later. Experimental work has shown that fall is as good a time for fertilizing trees as spring, and in some cases even better. Usually complete fertilizers are used, either the regular ones used for other garden operations or special tree fertilizers which are generally higher in nitrogen (10–6–4 or 12–6–4). Trees which are 6 inches or less in diameter at a point 3 feet above the ground are fertilized at the rate of 2 to 3 pounds per inch in diameter, while those larger than 6 inches are fertilized at the rate of 3 to 5 pounds per inch. For example, a tree 3 inches in diameter would be given 6 to 9 pounds of fertilizer while an 8-inch tree would receive 24 to 40 pounds.

The punch-bar method is the simplest way for the homeowner to apply fertilizer to trees: fertilizer is put into a series of holes punched in the ground with a crowbar or similar instrument. In heavy soils a crowbar may make the sides of the hole rather compacted so that the fertilizer will be available only to the adjacent roots. A soil auger is preferable because it leaves the earth around the hole more or less loose. In order to get a good distribution of fertilizer to as many roots as possible, it is necessary to make many holes. An arbitrary rule is to make 10 to 20 holes for each inch in the diameter of the tree. The holes are made 2 to 3 feet apart, beginning at a point about half-way between the trunk of the tree and the farthest reach of the branches, and continuing about the same distance beyond. These holes should be 18 to 24 inches deep. Usually a small portion of the fertilizer is placed in each hole (about ¼ to ⅓

Punch-bar method of fertilizing trees



pound) and the hole then filled with soil. But sometimes the fertilizer and soil are mixed before the holes are filled. In soils which are heavy and subject to compacting, the holes may be filled with sand or sand and peat; these many small columns of loose material aid somewhat in soil aeration. If entirely soluble fertilizers are available (such as "Nitrophoska" or "Ammo-phos"), they may be dissolved in water and poured into the holes in liquid form. Where nothing is growing under the trees the fertilizer may be scattered on the surface of the soil and spaded in, to a depth of 6 to 8 inches. This is possible with young trees or under trees with low hanging branches.

The professional arborist may use electric or compressed-air drills or soil augers to make the holes. One method blows compressed air into the soil to loosen it and break up compact areas without disturbing the lawn. Fertilizer is placed in the hole thus made and the compressed air helps to distribute it.

Buckwheat as a cover crop

McFarland photo

Shrubs and Herbaceous Beds

Deciduous shrubs are ordinarily not fertilized until spring; fertilizer such as 4–12–4 or 5–10–5 is applied at the rate of 2 to 4 pounds per 100 square feet of area around the plants. Narrow-leaf evergreens are fertilized as are deciduous shrubs; but they should not be fertilized too heavily because a dense compact growth is usually desired. Large evergreen trees are fertilized the same as deciduous trees.

Rhododendrons, azaleas, and similar plants of acid soil are usually not fertilized very often, especially if they have been planted in well prepared soil and provided with a mulch. In the fall it is important to build up the mulch to a thickness of several inches by adding leaf mold, peat, or leaves. When fertilizers are applied, slowly available types should be used, such as cottonseed meal or tankage.

Flower beds, the vegetable garden, and other areas which are bare during the winter will benefit by being spaded or plowed in the fall, if cover crops are not used. Partly decomposed compost or manure may be spread over the surface and turned under. Heavy soils are especially benefitted by fall plowing because the action of freezing and thawing makes them loose and mellow.

HOW TO PROPAGATE PERENNIALS

Simple instructions for the amateur

Esther Ann Huebner

HAVE you ever tried to propagate perennials? If not, you are missing a fascinating hobby as well as a thrifty means of stocking your garden so that it will be the envy of the neighbors. Most perennials can be propagated in several ways with very little trouble; and it is most gratifying to look at the final results and know that you had a part in the production of the new plants.

The requirements for this hobby are fairly simple: first, a bit of ground adequate for propagating the plants; next, of course, some perennials! Those already in your own garden or in the garden of a generous neighbor will provide something to begin on. In addition, buy a few from a nurseryman, or raise them directly from seed. A cold frame is a help; but if the garden is in a protected spot, you can manage successfully without one. If you have no cold frame, reserve a section of the garden as a nursery.

Next decide on the perennials, because the nature of the plant often influences its manner of propagation. Technically any perennial may be raised from seed, but sometimes it is not worth the effort. Some types take years to reach blooming size from seed, such as the peony. Others, the more highly bred forms of flowers such as phlox, will not come true to form; that is, if seeds are gathered from such flowers, the plants raised from them may be the offspring of crossbreeds and come out many shapes, sizes, and colors. In addition, most of the blossoms will resemble the smaller flowers or less attractive colors of the original parents. Plant breeding is a rather complicated science (or at least a special hobby in itself), and so it is better to leave it to those who know how, and buy seeds from a reliable seedsman.

Propagation by Seed

From midsummer to late summer is the ideal time to start perennials from seed. Fairly large seeds may be sown in rows directly in the cold frame or nursery. But it is much safer to start small seeds in flower pots or pans on the porch or indoors, as the seedlings will have a greater chance of survival under these conditions. The better the seedbed is prepared the more successful will be the results.

It is wise to sterilize the soil before planting, especially if it is to be used indoors; this will reduce the danger of damping-off. Sterilizing can be accomplished in several ways. One way is to soak the soil with a formaldehyde solution, 1 cup of formaldehyde to 1½ gallons of water. Then place burlap or many layers of newspaper on the soil to keep the fumes in, and leave undisturbed for twenty-four hours. Remove these coverings and turn the soil daily for three to five days—until the fumes have escaped. Formaldehyde dust is equally effective; follow the instructions on the container. Do not plant seeds while any odor of formaldehyde remains. This is important because formaldehyde fumes kill seedlings. Another method is to place slightly moist soil in covered pans in the oven at 160° to 180° F., and heat for twenty minutes at this temperature. Also there are several seed disinfectants available, such as "Cuperocide" and "Semesan," which will check damping-off. Merely place a pinch of any of these substances in the seed packet and shake gently so that each seed is coated with the powder; then sow the seed directly.

Outdoors the rows of perennial seed should be 6 inches apart for ease of cultivation. Indoors seed may be planted much closer. The depth varies with the size of the seed: usually about four times the diameter is correct; but it is always safe to follow the directions on the packet. Indoors seed is covered much more lightly than outdoors. Too thick sowing causes the seedlings to be crowded and weak. After seed has been sown, the soil should be firmed lightly with a tamper or a piece of board so that the seeds will be in good contact with the moist soil. The soil should never be allowed to become dry, as this is fatal to germinating seeds. Watering must be done carefully with a fine spray. When pots are used, they may be placed in a pan of shallow water until the surface is damp. This method of watering should be continued until the seedlings are fairly large.

After the seeds have germinated and produced true leaves,* they should be pricked out in rows in the nursery or cold frame so that they have plenty of room to grow into stocky plants. From this stage on the care is fairly simple. All that is necessary is to water them carefully and keep them free of weeds. The latter is very important, since most perennials are fairly small during their early stages of growth and are easily choked out by large weeds. If the plants are not in a cold frame they will need some winter protec-

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* The first two leaves are usually temporary "seed leaves," very different in form and size from the permanent "true leaves."

Balloon-flower (*Platycodon*)

McFarland photo

Louis Buhle photo

Low pots ("pans") for planting seeds. Left, covered with glass to prevent drying. Right, watering by placing in pan of water

tion; after the ground freezes, a little salt hay or excelsior should be put on. In the spring the plants can be placed out in the border; for they will be ready to bloom sometime during the season.

Propagated by Seed

Babys-breath (*Gypsophila paniculata*)
Balloon-flower (*Platycodon*)
Butterfly-weed (*Asclepias tuberosa*)
Candytuft (*Iberis*)
Columbine (*Aquilegia*)
Delphinium
Gaillardia
Lupine (*Lupinus*)
Painted daisy or pyrethrum (*Chrysanthemum coccineum*)
Primrose (*Primula*)
Purple rock-cress (*Aubrieta*)
Rocket (*Hesperis*)
Snow-in-summer (*Cerastium tomentosum*)
Turtle-head (*Chelone*)
Viola

When you are sowing perennials, why not try a few biennials such as foxglove or Canterbury bells? This group of plants flowers the following summer from seed, and is much neglected by the average gardener. Biennials are very easy to raise by the same procedure used for perennials. They may be planted in the border when the bulbs have finished flowering. Biennials have the added values of spectacular blossoms and flowering at a time of the year when there is a dearth of bloom in the garden. Like perennials, they need a little winter protection.

Vegetative Propagation

With the kinds of perennials which are difficult to raise from seed or do not come true to form, vegetative propagation must be employed. This consists in separating a piece of the plant and so treating it that it will become an independent plant. Such propagation has the advantage not only of being more rapid than the seed method, but also of resulting in a plant that is identical with the parent. Various methods are possible: softwood stem cuttings, root cuttings, division of clumps, layering, and division of rhizomes or of thickened roots.

The simplest method is division of the clump. This form of propagation is employed with those plants which tend by nature to spread by forming new crowns around the original plant. First dig up the plant and gently remove the excess soil from the roots. Next pull the sec-

Louis Buhle photo

Division of clump of speedwell (*Veronica*)

tions of the clump apart (using a knife if there are any connecting strands); and lo, you have several small plants. Then all that is necessary is to plant each section, and in due course of time it will develop into a full-size plant.

PROPAGATED BY DIVISION OF CLUMPS

Aster—all hardy types
Bleeding-heart (*Dicentra spectabilis*)
Chrysanthemum
Columbine (*Aquilegia*)
Coral-bells (*Heuchera sanguinea*)
Day-lily (*Hemerocallis*)
Delphinium
Golden-tuft or basket-of-gold (*Alyssum saxatile*)
Pink (*Dianthus*)
Primrose (*Primula*)
Purple rock-cress (*Aubrieta*)
Rock-cress (*Arabis*)
Snow-in-summer (*Cerastium tomentosum*)
Speedwell (*Veronica*)
Stonecrop (*Sedum*)

Propagation by rhizomes and thickened roots is somewhat similar to division of clumps. This method is practiced on plants with underground storage organs. The plant is dug up and divided with a knife into sections each having a piece of the thickened organ and one or more buds. The buds are necessary for the starting of top growth. With very tough roots, such as those of a peony, the temptation is to use an ax; but the pieces can be more easily separated with a jig saw, and later trimmed with a knife. At all costs, these portions must not be crushed or mangled; mutilated parts will rot before they have time to heal. A little powdered sulfur applied on the cut ends will check decay and give the sections a better chance of recovery.

PROPAGATED BY DIVISION OF RHIZOMES OR OF THICKENED ROOTS

Canna
Christmas-rose (*Helleborus niger*)
Iris—all rhizomatous types
Lily-of-the-valley (*Convallaria*)
Peony
Plantain-lily (*Hosta*)
Siebold primrose (*Primula Sieboldii*)
Trillium

Root cuttings are used with perennials which will regenerate new plants from pieces of roots with or without buds. Usually such roots are of a fibrous and slightly fleshy character. Phlox and poppies have roots of this type. The root is cut into sections an inch or more in length and laid horizontally about an inch deep in sand or sandy soil. When the little plants are about an inch high they should be pricked out and treated as seedlings. This method is fairly slow but will produce literally hundreds of little plants. If only a few plants are needed, a root or two may be dug up without disturbing the stock plant.

Division of rhizome of iris

Louis Buhle

PROPAGATED BY ROOT CUTTINGS

Japanese anemone (*Anemone japonica*)
Bleeding-heart (*Dicentra spectabilis*)
Bocconia
Butterfly-weed (*Asclepias tuberosa*)
Ceratostigma plumbaginoides
Coral-bells (*Heuchera sanguinea*)
Phlox (*Phlox decussata*)
Poppy (*Papaver*)
Soapwort (*Saponaria*)

Softwood stem cuttings can also be made. This is a useful method in cases where the stock plant is a single prized specimen belonging to a neighbor. It is also employed when fairly large quantities of a plant are desired. This method can be practiced at any time of the year, and is successful with many kinds of perennials.

Take a tip shoot about 2 to 3 inches long with a terminal bud and several nodes (places where leaves join the stem); make a smooth cut across the base of the stem just below a node. Next, remove the leaves from the lower half of the shoot, being sure there are at least two nodes thus left bare. Now you have a cutting ready to be placed in damp sand up to the remaining leaves. Leave the cuttings in damp sand until roots form (usually about three weeks), and then plant them out in the nursery or cold frame. If the cuttings begin to wilt, shade them with a piece of newspaper when the sun is shining. Root-inducing chemicals may be used to hasten rooting.

PROPAGATED BY SOFTWOOD CUTTINGS

Candytuft (*Iberis*)
Catnip (*Nepeta*)
Delphinium
Phlox
Rose daphne (*Daphne Cneorum*)
Sage (*Salvia*)
Soapwort (*Saponaria*).
Trailing arbutus (*Epigaea repens*)
Viola

Layering is another mode of propagation. It can be used with those plants that have trailing or flexible stems. This is a fairly sure method, and is employed with plants which are slow to propagate by stem cuttings. The stems are left on the parent plant, bent to the ground, and held down by hairpins or pieces of rock to keep one or more nodes in close contact with the soil. Roots will form at the nodes; they will grow more readily if the bark is injured slightly with a knife and the layer covered with a half-inch of soil. The soil around the layer should be kept moist until roots form. Then the layer may be severed from the parent and placed in the garden as an independent plant.

Louis Buhle photo

Making a cutting of chrysanthemum

PROPAGATED BY LAYERING

Candytuft (*Iberis*)
Germander (*Teucrium*)
Rose daphne (*Daphne Cneorum*)

Most perennials can be propagated in one or more of the ways mentioned. Possible methods can usually be determined by examining the plant; but in case of doubt it never does any harm to try several ways, to find out which is most successful.

Rooted cuttings of chrysanthemum

Louis Buhle phot

THE DAY-LILY, AN IDEAL SUMMER PERENNIAL

Recounting its virtues, and listing some outstanding varieties

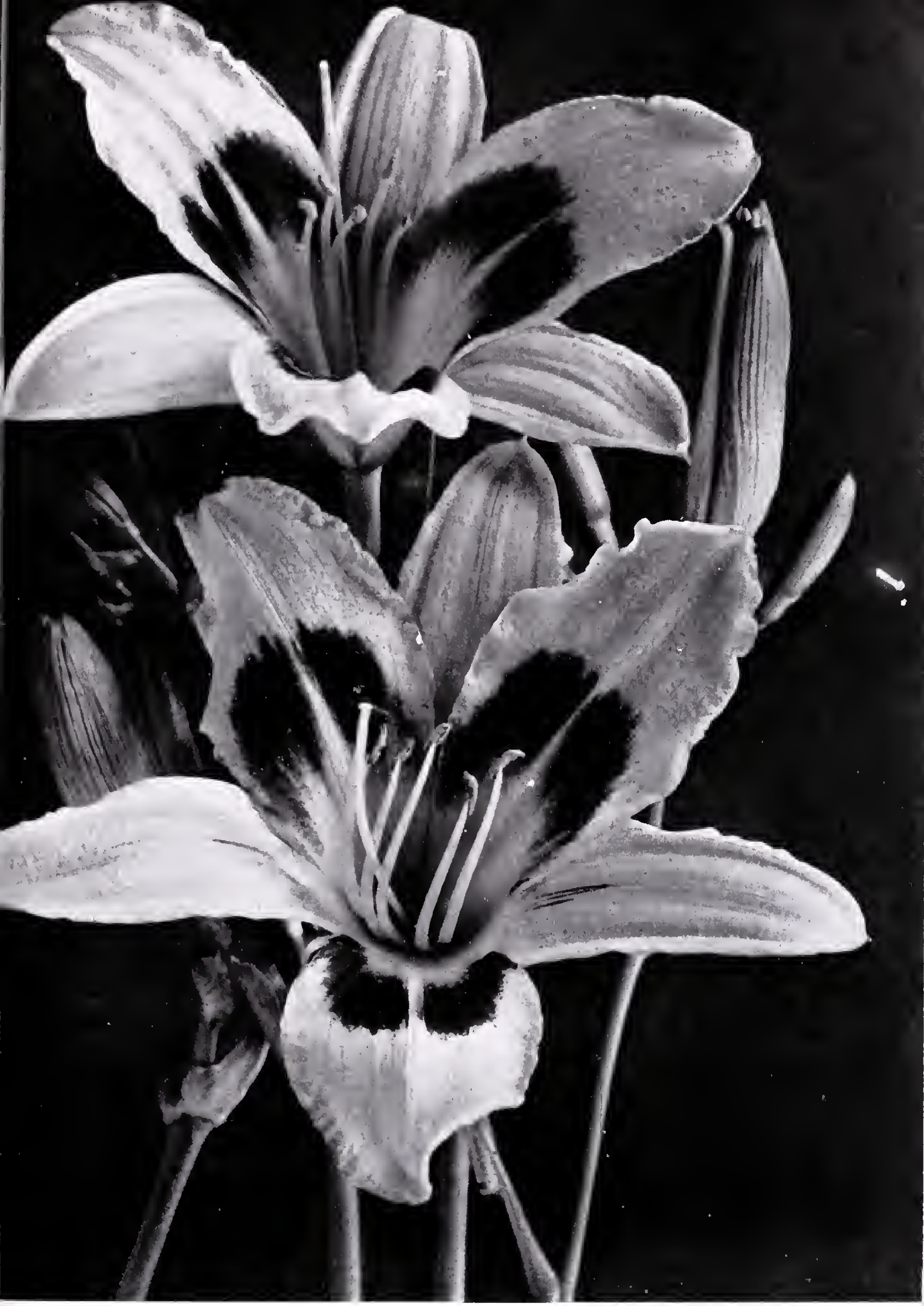
Elmer A. Claar

THERE is no reason why a garden should be devoid of bloom in late June, July, and August. Visit the garden of a day-lily enthusiast. Note the diversity in the color range of day-lilies—cream, yellow, orange, pink, red, purple, to almost black. Note the infinite variety of interesting color combinations, the various forms and patterns of the flower, the giants and the dwarfs, the blooming flowers from May to frost, and the ease of culture; and it will be evident that day-lilies are a must for any garden.

If deriving a profit from the sale of plants is a part of the problem, and what is desired is something that has a future, examine the facts. The day-lily is mounting in public favor faster than any other garden perennial in America. Nearly every iris and peony specialist is listing day-lilies in his catalog. At least two individuals, who still have a large and prosperous iris business, have told me that they make more money in day-lily sales than they do in iris. At least one man makes his entire living from the sale of day-lilies, and there are several individuals who list very few other flowers in their catalogs. The number of hybridizers is increasing rapidly, and it is almost impossible to keep up with the names of the new introductions.

Here is a flower that will satisfy almost any want of a gardener, with a minimum of effort. In the formal garden day-lilies provide masses of color over a long period, in both day and evening bloom. They may be used as accent plants, in naturalization, and in bouquets; or these delightful summer perennials will revive the spirits when the spring or fall favorites have gone or are not yet in bloom.

The following is a selection of named varieties of day-lilies which I like best, irrespective of price. In some color classes the selection is simple, but in others it is most difficult. There are many as yet unnamed seedlings which I am sure will, in time, replace some of these named varieties.



McFarland photo

Day-lily "Buckeye" (*Hemerocallis* hybrid)

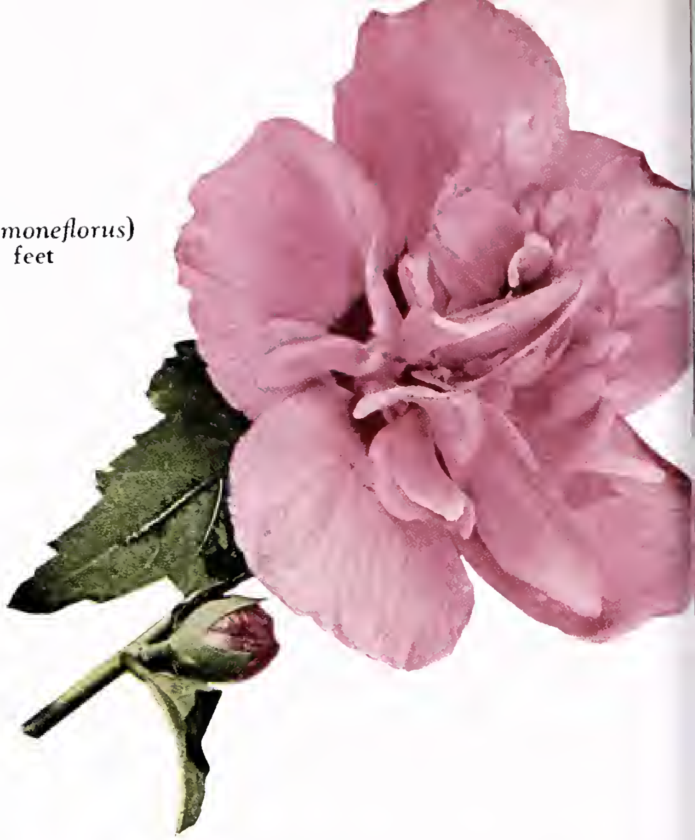
Summer-blooming Day-lilies

Cream	— Vespers
Light yellow	— Hesperus, Mission Bells, Mrs. B. F. Bonner
Yellow	— Mongol
Orange	— Joanne Hutchins
Orange-yellow	— Golden West
Pink	— Sweetbriar
Raspberry	— Piquante
Purple	— Potentate
Rose	— Dawn Play
Red	— General MacArthur, Red Sox
Maroon	— Morocco Red, Wolof
Bicolor:	
Pastel	— Debutante
Contrasting	— Bold Courtier
Polychrome	— Painted Lady, Twinkle Eye, Honey Redhead, Dr. Stout
Eyed variety	— Mikado

Day-lilies Noted for Special Characteristics

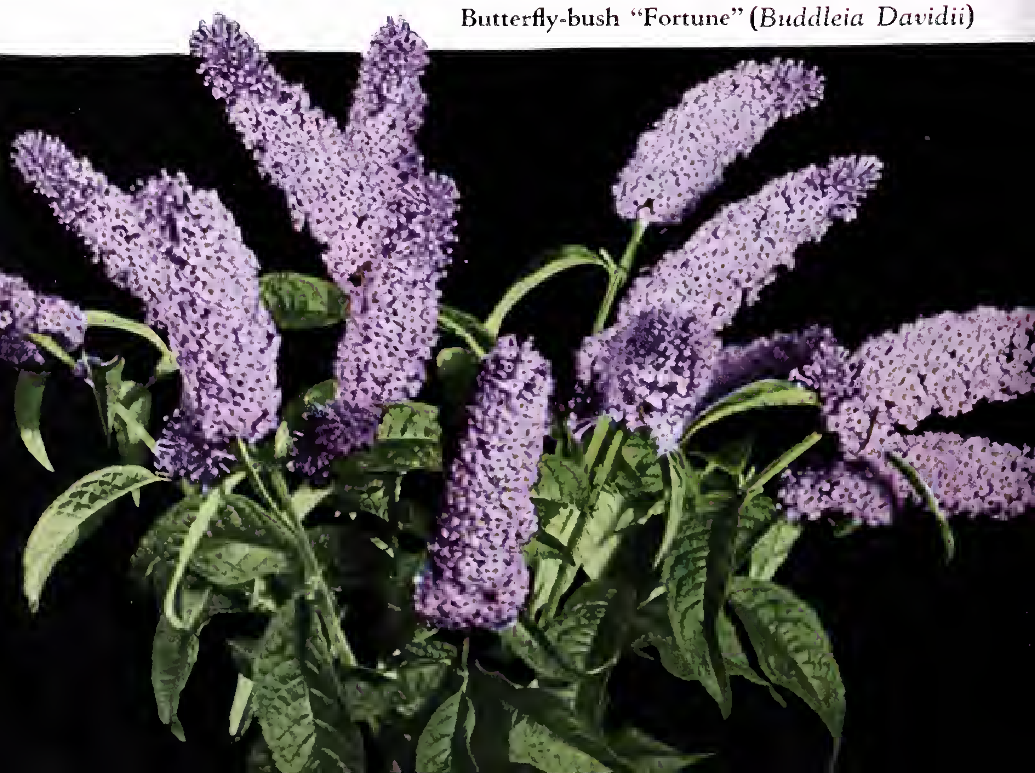
Eyed feature	— Mikado, Rajah, Aladdin, Buckeye, Gay Coquette
Curling and twisting	— Wau-Bun, Curly Pate, Taruga, Emily Hume
Fragrance	— *Hemerocallis flava, Hemerocallis citrina;* Lemon Queen, Ophir, Princess, Soudan, Yellow Hammer, Patricia
Bold striking contrast	— Mikado, Bagdad, Twinkle Eye, Gay Coquette, Rajah
Small-sized flowers	— Prima, Bijou, Boutonniere, Multiflora, So Big, Little Imp, Summer Multiflora, Black Sambo, Saturn, Little Cherub, Yeldrin, Tom Thumb
Large-sized flowers	— Star of Gold, Hesperus, Indian Chief, Mongol, Golden Dream, Byng of Vimy, Hyperion, Ophir, Twinkle Eye, Annis Victoria Russell, Flavia, Mission Bells, Gorgio, Massasoit, George Yeld, Swan, Aristocrat
Evening blooming	— Calypso, Gold Standard, Baroni, Citronella, Gold Imperial
Extended blooming	— Orangeman, Estmere, Tangerine, Apricot, Gold Dust, Sovereign, Aureole, Winsome, Sirius, Wau-Bun, Sir Michael Foster, Soudan, Radiant, Royal, Ophir, Mikado, Vesta, Hesperus, Mission Bells, Golden West
Tall plants	— Massasoit, Lady Fermoy Hesketh, Nebraska
Short plants	— Pigmy, Minor, Gracilis, Nana
Semidwarf	— Tangerine, Estmere, Orangeman, Gold Dust, Apricot, Sovereign
Double-flowered	— Kwanso, Flore Pleno

Day-lily "Ophir" (*Hemerocallis citrina* hybrid)

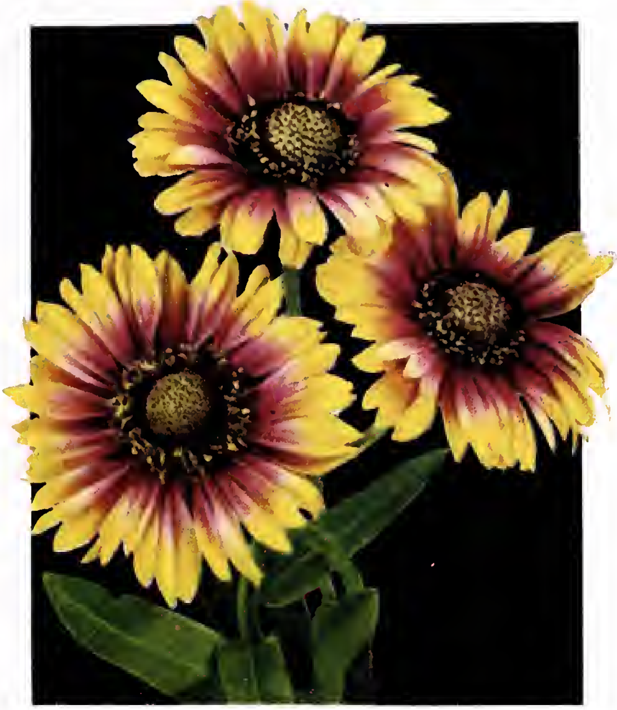


Rose-of-Sharon
(*Hibiscus syriacus* var. *anemoneflorus*)
a shrub to 10 or 12 feet

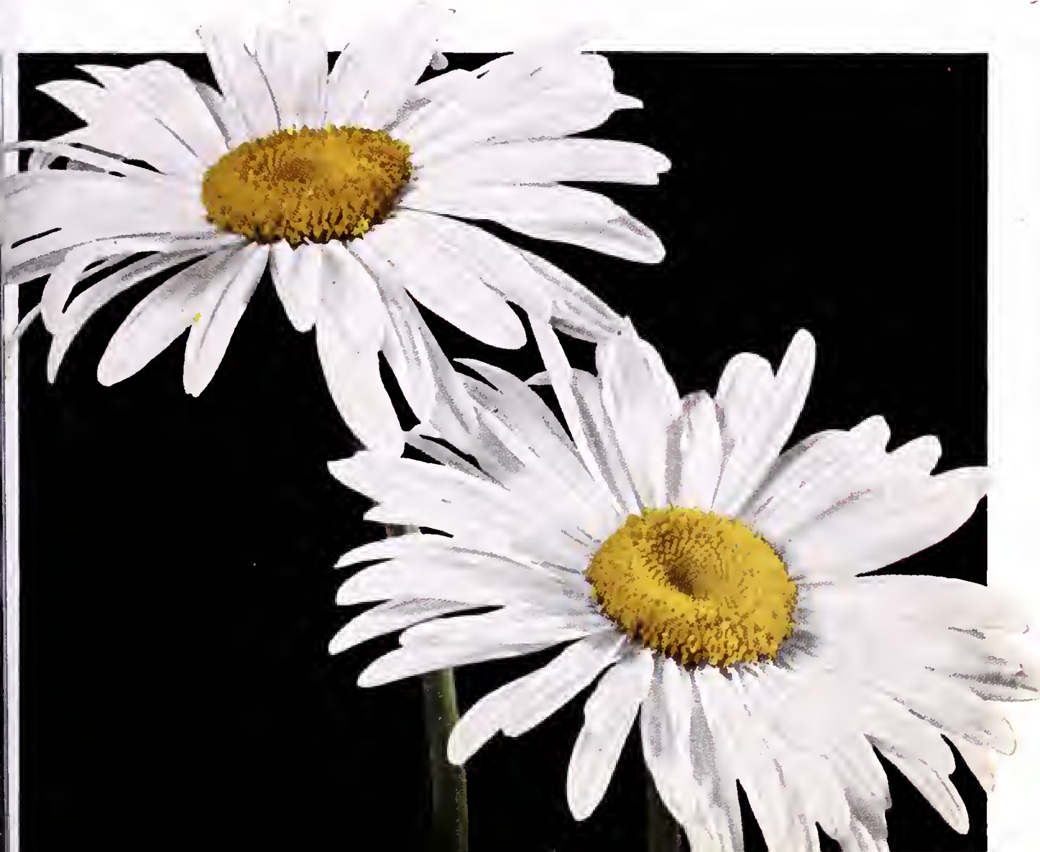
Butterfly-bush "Fortune" (*Buddleia Davidii*)



Gaillardia
(*Gaillardia aristata*)



Shasta Daisy (*Chrysanthemum maximum*)



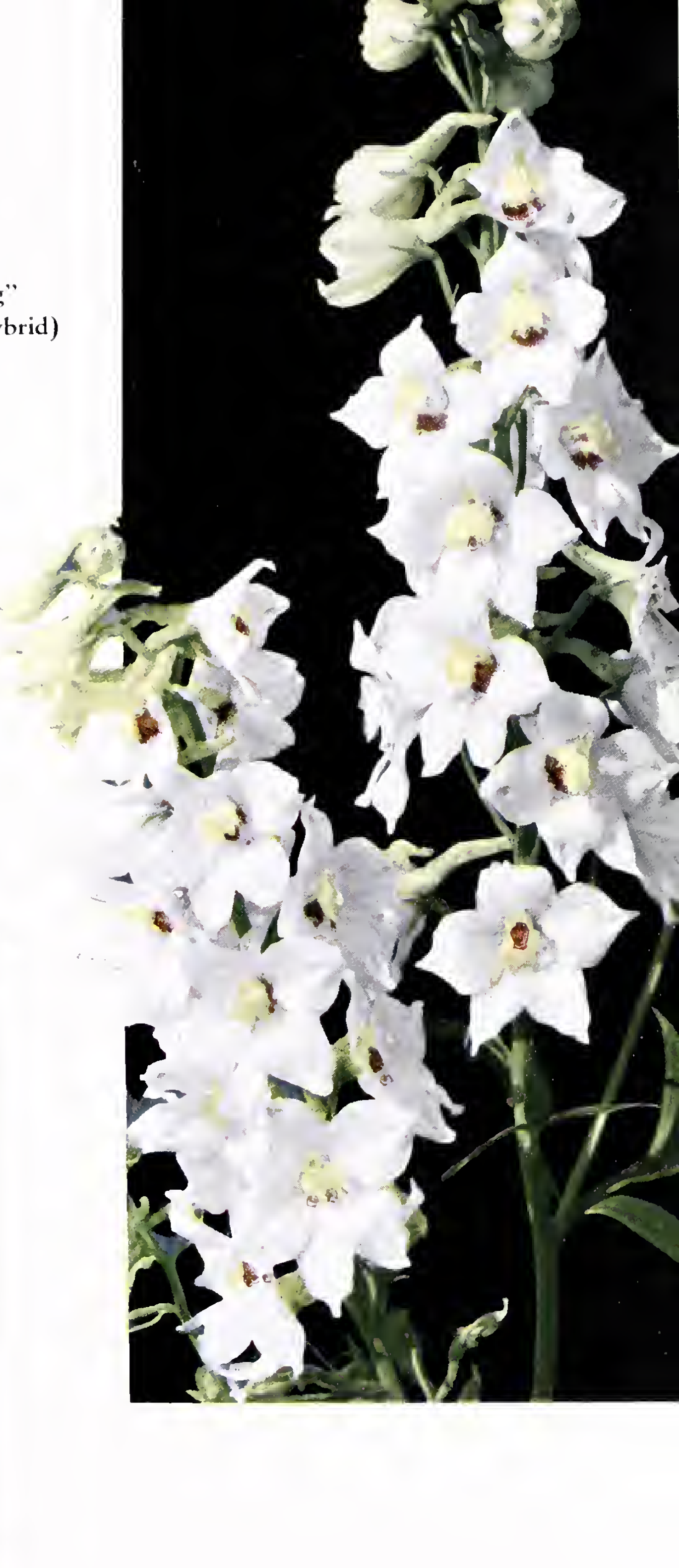
Gay Color in the S

—a Perennial Border

Coreopsis (*Coreopsis grandiflora*)

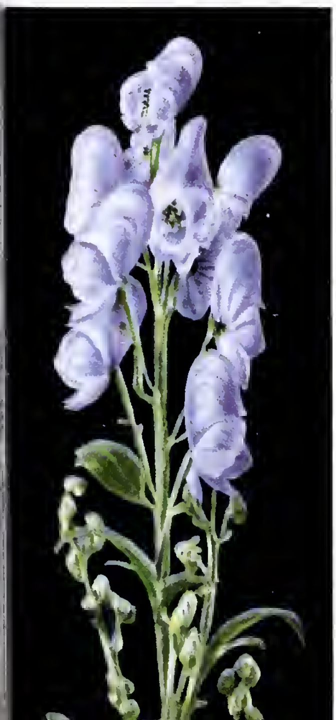
Liatris
(*Liatris pycnostachya*)

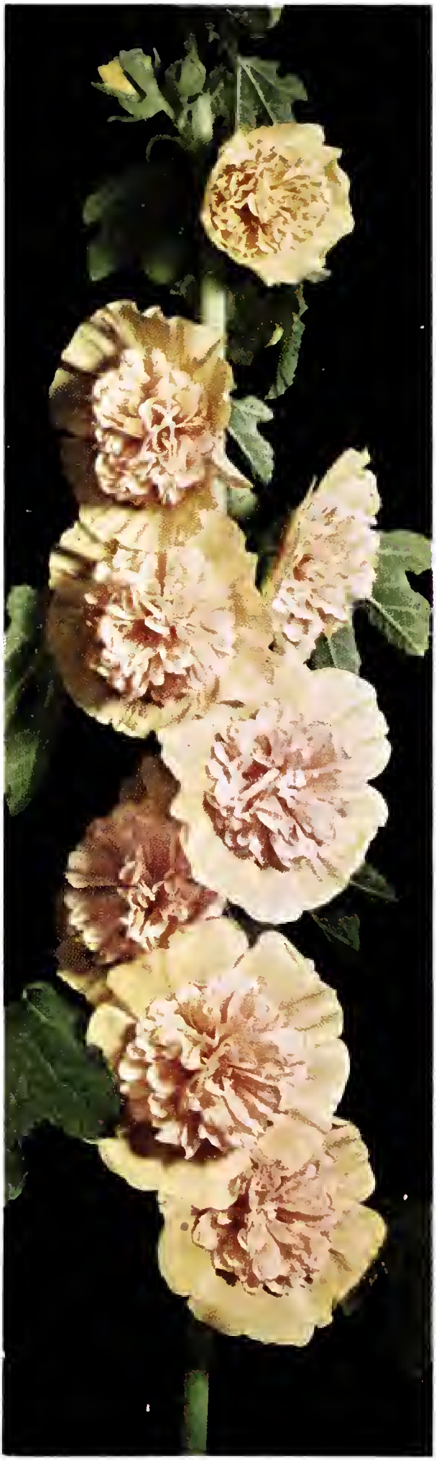
Japanese Iris (*Iris Kaempferi*



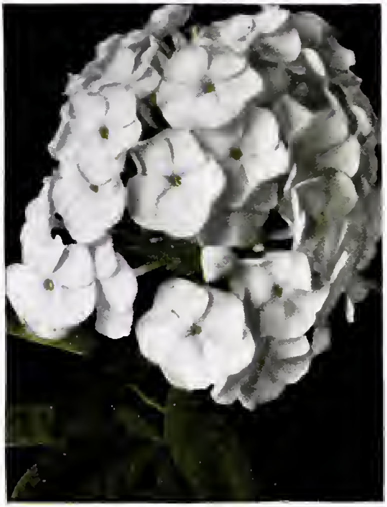
Delphinium "Iceberg"
(*Delphinium elatum* hybrid)

Monkshood
(*Aconitum Fischeri*)



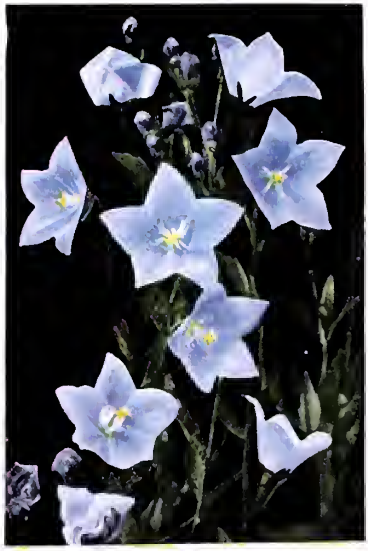


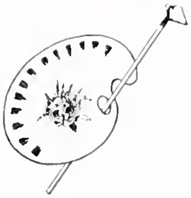
Double Hollyhock (*Althaea rosea*)



Phlox "Mrs. Jenkins"
(*Phlox decussata*)

Balloon-flower
(*Platycodon grandiflorum*)





COLOR IN THE GARDEN

Some general principles for guidance

Frederick N. Evans

ATTENTION to color handling in the garden is worth while in that thereby the garden may be lifted out of the ordinary and given real individuality. Color indicates the mood of the garden; it is the garden's way of talking to us. Color in the open has its appeal to all of us; there is something joyous about it.

A consideration of color can be just as complicated as one cares to make it, with possible psychological and even rather deep philosophical ramifications; and an account of the subject may be made too involved to be interesting to anyone but the writer. But there are certain rather simple theories that may be applied profitably to the garden by those who have not before had them called to their attention, or may be restated with profit, and reviewed by those who already know them.

Flowers of the garden are generally in the upper rather than in the lower register. Though there are some low hues, as for example the rich dark purple petunia, so popular because of its unusual color quality, the majority of garden flowers are upward toward white. Also most flower colors are usually found to be pure ones; that is, Nature seldom goes in for neutralization or graying down of hues. The dull greenish purple of the Cobaea blossom and the mottled greenish passionflower, like the dull flower of the Jack-in-the-pulpit, are some of the exceptions in the gamut of pure color which flowers offer us. The pinks, light blues, and high lavenders of flower color usually may be called pure tones. They are simply tones of red, blue, and violet high in the value register toward white. The green foliage of trees and shrubs, with the foliage of the flowering plants themselves, is of course the great "backdrop" against which our garden flowers are seen.

Complementary Colors

To get acquainted with color in the abstract would be profitable in any extended study of flower color, but there is hardly time for it here. It would be helpful however to say that, were we to arrange the primary colors, yellow, blue, and red, about a "color wheel," with yellow, blue, and red in the clock intervals of 12, 4, and 8 respectively; and put the secondaries, green at 2, violet at 6, and orange at 10 o'clock, we would note that the hues directly opposite each other on the dial are complementaries, or in other words those which mixed together give gray.

Direct complementary colors or opposite colors bring out each other's hues more vividly than any other combination. The practical application of this principle of the use of opposites is seen in planting the purple New England aster next to the yellow slender-leaved sunflower, *Helianthus orgyalis;* this gives a contrast which at once catches the eye. Similarly a bed of orange pot-marigolds with a border of blue viola or dwarf ageratum presents a pleasing and very distinct contrast.

Flower neutralization is seen in viewing a bed of zinnias from a distance. There are so many colors in a bed of zinnias that the effect is a graying down. Pansies of many hues in the same bed give a similar effect. While both of the plants named have great value and are extremely pleasant at close range, there is no doubt that for large mass carrying, their effect is lost to some extent.

Few blossoms have poor color; but the inky blue shrub-althaea or rose-of-Sharon, the watermelon-colored crape-myrtle, and some uncertain shades of Madagascar periwinkle, *Vinca rosea,* are less attractive than some others.

Color Clashes

It is a trait of human nature that when we fancy we have a certain amount of knowledge of any subject we like to theorize about it. The writer has observed that garden lovers sometimes get a certain pleasure from worrying about color clashes in the garden. It is true that the purple plum and scarlet Japanese quince are terrible garden bedfellows, and that a group of orange marigolds and rosy red verbenas should not be planted together; but such combinations are very much the exception.

When analyzed, color clashes come about from the juxtaposition of certain body colors with others which are basically similar but whose pull is in the opposite direction. Scarlet, for example, does not go well with rose red because, though both are on the reddish side, the pull of the scarlet is toward orange while the rose red is toward a bluish hue. Even certain blues are not pleasant together, as for example a reddish blue near a greenish blue.

Disturbing and decidedly unpleasant color dissonance comes about only when the measures or areas of basically inharmonious hues are too nearly equal. Color dissonance experienced in viewing a scarlet Spanish shawl on which are embroidered small pink rose buds is stimulating rather than displeasing. Modern painting is full of intentional but seemingly accidental color clashes. It is the modern painter's way of giving us a start. The same principle can be used occasionally in the flower garden, particularly in the modern garden, whose aim at its present stage of development appears to be avowedly to get away from preceding tradition. If one remembers to keep the size of the masses of dissonant colors decidedly unequal, the effect in the garden is sometimes, as already suggested, stimulating rather than disagreeable.

White is the great reconciler of colors, out of doors as well as in the interior bouquet. Where there may be danger of color clash, white flowers inserted in the bed, as in the flower arrangement, will always pull colors together. White also intensifies garden color, and therefore plenty of it is welcome in any flower planting. For night effects, light blues, pale yellows, and of course white are of great value.

Accents

Color accents here and there are desirable, as for example groups of pale blue delphiniums, so disposed as to make rhythmically recurring spots of interest; these add to the beauty of the flower border, and so do accents of any decided color carefully disposed, as in the use of the torch-lily (*Kniphofia*) by the garden entrance path or by the steps. Also one should not lose sight of the value of definite, recurring areas of the same hue here and there throughout the garden.

Gardens of Special Color

The thought of working out a garden of special color is an intriguing one, and one which theoretically has great possibilities. The plan of working out a blue-and-white garden, or one of pink and silver, using one of the numerous dusty millers, or a gold-and-purple garden, has often been attempted with a success interesting to the visitor. The theory has its limitations, in being most successful when confined to gardens of decidedly small size, or to portions of large gardens come upon as units apart. It is recommendable for the patio, or for portions which, in a rock garden, for example, tell as special units in the scheme, and are seen by themselves. On the whole, the larger garden area loses so much of its very lively multicolored interest by having colors too arbitrarily limited, that the idea of the garden of special color is to be approached with caution.

Little has been said regarding specific combinations of flowering plants whose color is pleasing. This must be worked out by the individual gardener, who will find the general thought of garden color an interesting one to keep in mind.

In closing, the most important admonitions regarding color in the garden are: 1. Have whatever color masses one goes in for, sizeable, so that each will tell its story forcibly. Too many small patches fritter away the garden's effect. 2. Use plenty of white in the garden, for the double purpose of reconciling possible color clashes, and intensifying the existing color.

Path bordered with shrubs and perennials

McFarland photo

CLEMATIS HYBRIDS

Most ornamental when climbing through a shrub or another type of vine

Margaretta Duane Wood

MOST of the large-flowered clematis hybrids are not so temperamental as is generally assumed. These vines will grow and give pleasure for many years if they are properly planted, given adequate support, watered regularly, and fertilized and pruned.

Planting and Support

The first and most important step is planting. The location must be well considered, for the plants need a cool, porous soil. If the soil is heavy, sand or leached coal ashes can be added. Crushed stone or slag in the bottom of the planting hole aids quick drainage.

If the stems are fastened to a stone wall that is heated by the midday sun, wilting will result and the plant will become weakened. On the ground around the roots, shade should be provided by a low wall or by low-growing perennials. Once established, the vines thrive in deep shade, but they will not bloom profusely unless they can reach into sunlight.

The support is of prime importance. From the start the stems should be trained up a sturdy foundation; they will do nothing if allowed to lie on the ground. The most satisfactory support is chicken wire stretched between posts or tacked to stone walls facing away from the afternoon sun. Deciduous shrubs or slow-growing evergreens make ideal foundations providing semishade, cool soil, pliable support, and general protection. However, it is more difficult to establish the vines under a shrub.

Watering, Fertilizing, Pruning

Clematis should never be allowed to become dry. In summer, watering once a week is good insurance. Much as the plants need water, however, their soil must have good drainage: water must not be allowed to stand near the roots.

For fertilizer a 5–10–5 mixture should be used, in the spring and again in the fall. The fall application should be made early, so that the plants will go into the winter with a sturdy mature growth, rather than with a new tender one such as would be forced by a late application. Clematis hybrids are gross feeders; they react quickly to nourishment; the size of their blossoms increases, and their growth is taller. A handful of fertilizer is ample for new plants. The amount should be increased in proportion to size and age. The fertilizer should be sprinkled over the ground and scratched lightly into the surface. Even though the original roots are se deep, the plants have a tendency to send out other roots near the surface; and dee or rough cultivation can be injurious. The fertilizer can be made available to the deep roots by liberal watering im mediately after application. It is refreshing to find a plant that does not need to be cultivated; merely pulling out the young weeds is all that is necessary.

On acid soil it is beneficial to give the plants a dressing of lime every few years. However, in southeastern Pennsylvania we do not believe that a strongly alkaline soil is essential. Tests made around our healthiest plants showed the soil to be slightly acid (pH6).

A clematis should never be pruned until it is well established. The Jackmanii, Viticella, and Lanuginosa hybrids bloom on the new season's growth and can be cut back early in the spring to about one third of their total size. The Patens and Florida hybrids bloom on short new shoots coming from the old wood, and need only to be trimmed or shaped later in the spring after the leaf buds begin to swell.

Growth Characteristics

Clematis hybrids apparently have cycles of vigorous growth. One should not be impatient while these vines are becoming established. They take at least two years, and often longer. During these first few years they are rather poor specimens; and an individual plant may vanish from sight for a long period. Then comes a year when they put forth two to six magnificent blossoms. The following three years or so they are at their height of vigor; then they appear to exhaust themselves and steadily go into a decline. That is the time (about every five or six years) to cut them down almost to the ground. If this is not done,

Clematis "Ramona" (*Clematis lanuginosa* hybrid), with lavender-blue flowers

Louis Buhle photo

the plants may disappear permanently. If it is done, then in two years they will come back to their old glory. Most of our plants, now thriving, have been considered dead at one time or another. As a specific example, a Crimson King planted in 1939 was crossed off our list as dead in 1941. It reappeared in 1946, bloomed in June, and reached the top of a 12-foot wall in time for the fall blossoms. This unusually dramatic individual serves as an illustration; one must not give up hope just because a clematis disappears from view.

One should not expect the vines of the large-flowered hybrids to be showy or to act as a curtain. Most of the year these climbers are not picturesque; and in August the leaves are even likely to turn brown and become unsightly. No one seems to know the reason for this; but to prevent it and to bring on new growth an application of 1 ounce of nitrate of soda in 10 quarts of water should be made after flowering. After this treatment the plant should put out new growth and have a second blooming period. For garden beauty clematis should be allowed to climb through another type of vine or a shrub. This prevents such foliage faults from spoiling the effect.

Clematis "Crimson King" (*Clematis lanuginosa* hybrid)

Author photo

Enemies

Mice, rabbits, and cutworms are all troublesome enemies. A close-fitting collar of zinc or an inverted flower pot with the bottom broken out is a good protection for young plants. But on older plants with many or thick stems these narrow collars must be removed to avoid injury to the trunks. A spadeful of leached coal ashes hilled around the base in the fall is an excellent protection. This must be leveled off in the spring and worked lightly into the topsoil to allow the new shoots to break through and to prevent the roots from coming above the ground level.

If a clematis is kept in a healthy state, the chances of its succumbing to wilt are small; but when symptoms of wilt are found, the diseased parts and surrounding portions should be cut to the ground. New shoots should start up in time.

Too often the symptoms produced by cutworms, mice, drought, poor drainage, lack of support, and hot walls are attributed to the wilt disease; and the habit of the plants of disappearing for prolonged intervals often causes them to be prematurely given up as dead. Thus, because of lack of understanding by the garden owner, the plants are wrongly believed to be temperamental and difficult to raise. If good stock is properly planted and kept in a vigorous growing condition with routine care, the vines are remarkably disease- and pest-resistant. The individual plant will reward proper care for many years with a profusion of bloom in the spring and a lesser show in the fall. A selected collection of clematis hybrids will provide at least a few blossoms almost the entire summer; and an individual magnificent flower will last for a long time either in a vase or on the vine.

FRAGRANT PHLOX

Good varieties, and how to care for them

Alex Cumming

WHEN the abundance of spring-flowering material has more or less spent itself, and before the fall-flowering kinds appear—that is the time when phlox, almost alone, carries the garden or hardy border. A beautiful job it can do, too, if given the care it deserves, which, by the way, is less than most of our garden favorites demand—*providing.* "Providing" seems to be the hitch which creeps into a subject just as one warms up to it. But here the proviso, important though it is, need not be discouraging. Good, clean, healthy plants to start with, and rich soil in which to grow them, are the main needs.

Culture

PLANTING. Good soil is vital. This hardy phlox is a voracious feeder, and so the soil must be prepared well. If the soil is in reasonably good condition, add a 6-inch layer of good barnyard manure and a generous dusting of bone meal. Work this all well into the soil to a depth of 18 to 24 inches. If planting is to be done immediately, firm this freshly prepared soil by tramping on it lightly; then loosen the upper 6 inches, set the plants, and firm the soil again.

After this, good culture is all that is needed. Water only when necessary, and then water copiously. Cultivate every week or ten days until midsummer; then discontinue cultivation, and add a 2-inch mulch of peat-moss, leaf mold, or any good mulch that will take water throughout the flowering season, most of which will be hot and dry.

With proper conditions taken care of, let us give some thought to setting phlox in the average garden for effect. As regards color there will be no great difficulty if the crimson and dazzling red kinds are kept well in the background, pinks and salmon-pinks to the fore. Personally, I like to see these salmon shades livened up a little with the carmine-red Leo Schlageter. The so-called "blue" shades are more difficult to place to advantage, but they can be separated from the stronger colors by a mass of white. I like to give the blues a place of their own, partially shaded if possible, for they look their best where the light is not too strong, and they are subject to sunscald. Add a clump or two of white as a deep background; this makes a restful picture. Folks rarely agree on color combinations, however, and so I humbly suggest that you do it in your own way.

SPACING. This depends largely on how the plants are to be used. In straight rows or dividing lines, 20 inches apart is right; in a triangular group of three, 15 inches will assure a large clump within a season. Where solid effect is desired, 18 inches apart will work out well, with the outside plants 12 inches from the edge.

The garden value of the single plant should not be overlooked. A well-grown specimen or single plant will be sufficiently effective in the average-size garden: and grown thus, it can be left undisturbed as long as it is healthy, which should be several years. The closer plantings will require division and renewed soil in the third or possibly the second year.

Preventing "Reversions." It is important to trim off the old flower trusses to prevent seeding. Seeding is the main reason why many gardeners think their good phlox varieties are reverting to a primitive type. Under commercial conditions where phlox is grown by the thousands, true reversion is about as rare as mutation or sport development. But seed virtually shot from the capsule may lodge under a near-by plant, germinate, and outgrow that plant by reason of its seedling vigor. Since phlox seedlings are prone to revert to the magenta or lavender of the ancestral type, this magenta invasion should be stopped before it begins. Do not let seed develop. Incidentally, when the old flower trusses are removed, all of the good foliage should be left, because a second display of flowers will develop along the remaining stem.

Good Varieties

White

Mary Louise, finest of all the whites, makes a shapely 2½- to 3-foot plant with very large, handsome trusses. Its individual florets are unusually large, and white as purest marble.

Miss Lingard. This good old stand-by is the only one of the suffruticosa type (*Phlox carolina*) that one can be really enthusiastic over. All others mentioned here are *Phlox paniculata*. It is the first of the summer phlox to bloom; beginning in early June, it goes on through the season. White with the faintest flush of pink, it has shapely, conical trusses; the foliage is glossy, and the growing habit is erect and tidy. Its height is 2 to 2½ feet.

Red and Crimson

Leo Schlageter, up to now, has been my first and last choice in the whole red group. It is rich carmine, sometimes scarlet-red, red enough for any purpose yet never harsh. It can be combined with the salmon, or even the pink kinds, and never be inharmonious. It is a fine, clean-growing, 2½-foot plant.

Charles Curtis. This recent addition is, perhaps, one of the most talked-about varieties in circulation just now, because the original stock imported from Europe seems to be more or less mixed with Spitfire. The true Charles Curtis is red (turkey-red officially), very brilliant, with huge, shapely trusses on large 2½- to 3-foot plants. Supposedly introduced as an improved Leo Schlageter, it looks as if that is just what it is.

San Antonio. Here is a blood-red variety that is actually dazzling. Since it is least inclined to bleach or sunburn under hot weather conditions, I think it the best of the really vivid group. It makes a strong 2½-foot plant.

Pink

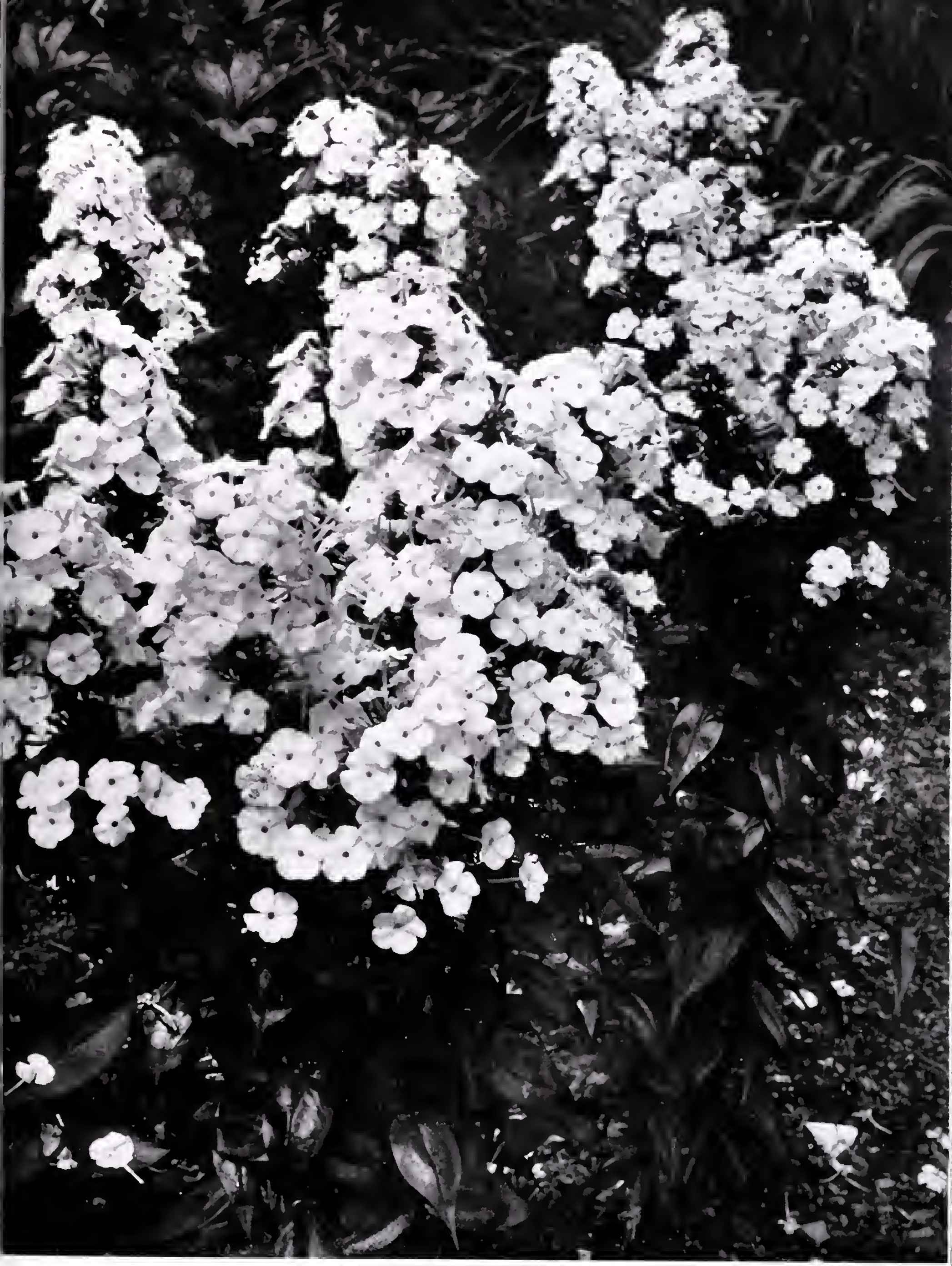
Jules Sandeau. This old stand-by, lively watermelon-pink, will remain in a healthy and attractive condition for more years than any variety of which I know. It is a compact, 18-inch plant, a colorful phlox that can be planted and then more or less forgotten.

Columbia and **Lilian** are a nice soft pink. These two are similar in effect, but Columbia makes a tidier plant.

Apple Blossom and **Pinkette,** the names of which are descriptive, are more delicate in effect. These are two comparatively new kinds.

Salmon Shades

Spitfire. Recently imported, this fine plant was originally Frau Alfred v. Mauthner, and afterwards changed by the originator to the very appropriate name, Spitfire. Glowing salmon-orange, it is



McFarland photo

Phlox "Miss Lingard" (*Phlox carolina* hybrid) conspicuously vivid among the best of the salmons; and it does not sunburn readily in hot weather.

Salmon Glow. A remarkably vivid flame-salmon, further illumined by its carmine eye. Its trusses are enormous and long-lasting. No phlox is better-growing or more effective than this one if the stock is healthy.

Salmon Beauty is somewhat soft in effect; yet it is definitely handsome, and it blends nicely. It is a compact 2-foot plant with large florets and flower heads.

"BLUE"

There is no blue phlox; but some of the varieties approach blue when conditions are favorable. In strong sunlight, lavender and magenta tints seem to dominate this group. Local conditions seem to have a bearing on all phlox varieties. The dominance and thrifty appearance of one particular phlox in an entire community is sometimes noticeable. This is particularly true in the so-called "blue" varieties. The best way is to test several varieties.

Ethel Pritchard (old) and **Progress** and **Blue Boy** (newer) should not be overlooked.

Phlox "Columbia" (*Phlox paniculata* hybrid)

McFarland photo

Pests

Eelworm. It is important to have healthy plants because there is an eelworm (stem or root nematode) which is very likely to infest phlox plants that have been neglected or grown with other phlox varieties in the same area too long. Stunted plants, twisted stems and leaves, and failure to bloom, are the symptoms. If these conditions are present in your phlox now, dig them up carefully with all the roots, and burn them. This is to prevent the spread of the eelworm through the garden and to other plants. A possible remedy for this nematode might be the new sodium selenate which can be had in the commercial form P–40. This is dusted on the soil immediately around the plants. Absorbed by the plant, the selenate will eventually reach and destroy the nematode which may be working within the root or leaf. I have not had an opportunity to use P–40 on phlox; but it works well on similarly affected chrysanthemums, and would be worth a trial.

Or take soft tip cuttings from your choicest plants about mid-May (they root easily in moist sand); the nematode will not yet have worked itself up to the soft tips. When they are rooted, set the young plants out where phlox or chrysanthemums have not been grown, give them good growing conditions, and you will be surprised at their recovery.

Red Spider is perhaps the most troublesome pest, first indicated by yellowing of the lower leaves, usually beginning about mid-June. Examine the lower side of the leaves with a magnifying glass before that time. If a rather prominent web-like coating is present, that means red spider. These pests can be so numerous that the magnifying glass is not needed. In either case, nematode or red spider, a well-grown plant is largely immune. Ill-fed, stunted plants are easy marks for both insects and diseases; so also are normally healthy plants that are suffering from dryness well down in the root clump during hot spells (when a temporary check in growth occurs). Begin watching the plants in early June. They should be growing thriftily. Before this dry condition sets in, water the plants very thoroughly, always using a slowly running hose right on the soil. Overhead watering or sprinkling invites mildew and provides the perfect condition for the spread of nematodes. In early June (or late May, for the South), in addition to the afore-mentioned watering, dust the leaves, particularly on the under side, with a mixture of three parts dusting sulfur and one part fermate. Apply early or late, whenever it will stick best. Repeat this treatment just before the buds show color, and again when the flower trusses are past their best.

McFarland photo

Phlox "Progress" (*Phlox paniculata* hybrid)

Mildew usually appears about mid-June, covering the foliage with a powdery white coating. The dusting mentioned above plus good growing conditions should take care of mildew nicely; but when this fails, try liver of sulfur. Get this fresh from the druggist—it comes in rock form. Dissolve an ounce in a quart of lukewarm water, then add 3½ gallons of lukewarm soapy water. Use a fine, powerful spray and drench the foliage top and bottom. This solution discolors white paint and has a strong odor; but it is the best remedy that I know for mildew.

HORSE-BRIER KILLED BY 2-4-D

Complete destruction of an 80- by 20-foot colony of horse-brier (*Smilax rotundifolia*), by spraying with 2-4-D is reported by Walter D. Baldsiefen of Metuchen, N. J. A 12/100 per cent solution of the monohydrated sodium salt of 2-4-D was used, with a spreading agent, such as duPont's M P 189. The weed was sprayed early in June 1946, and again two or three weeks later. On June 1, 1947 there was not a sign of life in the horse-brier plants.

More about how to kill this troublesome plant will appear in a future issue of Plants & Gardens.

NORTH WITH PERENNIALS

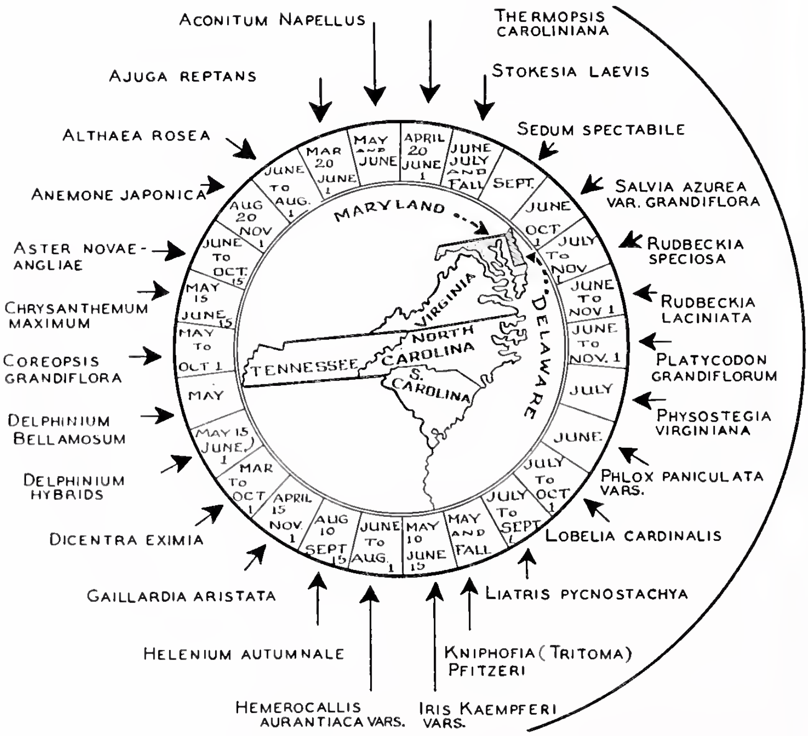
Dates of bloom from South Carolina to New England

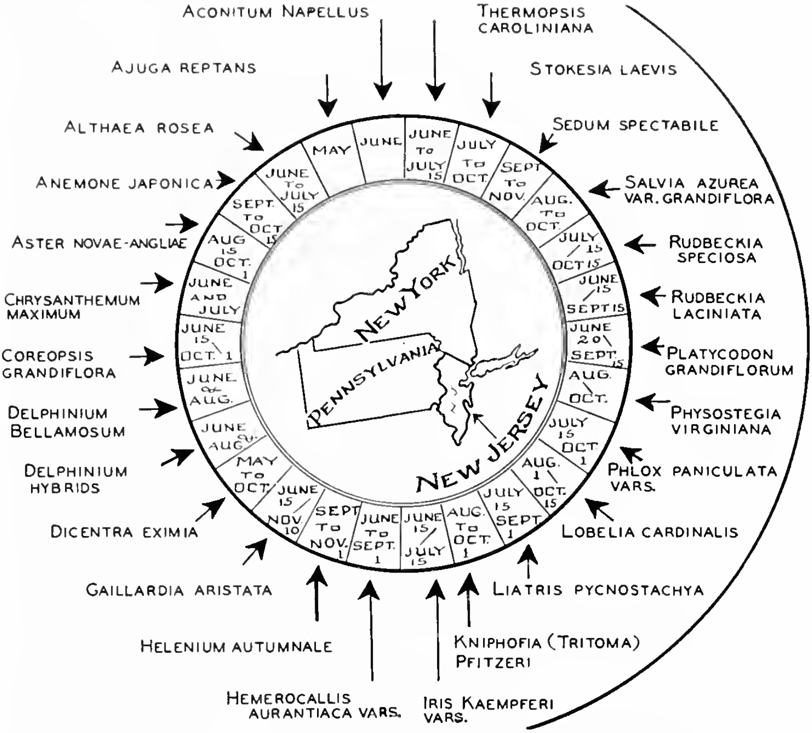
Elizabeth Clarke

A COLORFUL garden throughout the season requires careful planning. It is important to know when perennials flower because they are the permanent plants around which others are added. The climate, the soil, and the location and exposure of the garden all influence the time of blossoming. A garden on a southern slope will have flowers earlier than one having only afternoon sun. Plants in the city often come into flower earlier than those in the country, depending on the soil of the area and the protection afforded by buildings. The kind of attention the plants receive has some effect also; for example, with many plants, removing the old flowers tends to lengthen the blooming period.

Periods of bloom for South Atlantic States

Drawing by Michalena L. Carroll





Drawing by Michalena L. Carroll

Periods of bloom for Middle Atlantic States

In the spring there may be marked differences in dates of blooming from year to year. But as the season progresses, the variation gradually decreases; and by summer the blooming dates are usually more constant. The time of the latest killing frost varies from March 1, along the coast of South Carolina and Georgia, to June 1, along the northern boundary of the United States.

The charts show the blossoming periods of a group of selected perennials which are successful in three regions along the eastern coast of the United States. The data are a compilation of records over a period of years.

For the South Atlantic States, North Carolina was used as a guide for dates of bloom. In general, flowers bloom there from two weeks to a month ahead of the same kind in the Middle Atlantic area; but this depends on the climate, which varies from the mountains to the coast. A few perennials become almost everblooming, as the blue sages (*Salvia*); while some autumn-flowering ones begin to blossom in June, as is the case with the New England aster (*Aster novae-angliae*). The Stokes aster (*Stokesia laevis*) blossoms in June, and then again in the fall.

For flowering dates in the Middle Atlantic States, the New York City area

was used. Long Island, of course, has the longest growing season in New York State. Hybrid Delphiniums in the Middle Atlantic States are very temperamental, and change their growth characteristics easily; they are best treated as biennials, since the summers are sudden and hot.

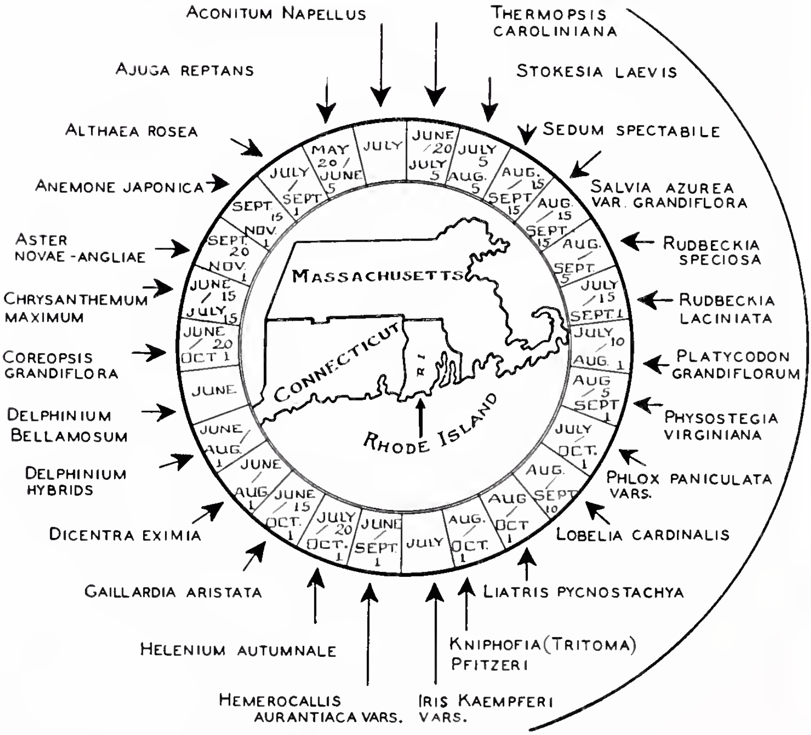
Massachusetts was selected as a center for the southern New England States. Flowering dates are often from two to four weeks later there than in the Middle Atlantic States. In southern New England, where the evenings are cool, Delphiniums will bloom to perfection in the summer year after year, and often again in the fall.

Torch-lily (*Tritoma* "Mt. Etna")

McFarland photo

Periods of bloom for southern New England

Drawing by Michalena L. Carroll



GROUND COVERS

Refreshing suggestions for summer attractiveness

Agnes Tamm Nemiccolo

THE uses of ground covers are as varied as the plants that are suitable for this purpose. They are good under trees, where most grasses will not grow, to catch and hide fallen leaves so that these are not unsightly yet stay and add humus to the soil; to face down lawns and blend them with tree and shrub plantings; for an informal edge in a planting; to prevent erosion on a slope or embankment; to cut down maintenance where grass cutting is difficult or inconvenient, as on banks and cemetery plots; for carpeting effects in rose gardens or small areas like terraces or sunken panels; as a moisture retainer and shade provider for bulbous plants; to soften the sharp outlines of stones in paved areas; and as a variation from grasses.

There are about a hundred ground covers in use in this part of our country, ranging from tiny annuals like portulaca, through sprawling vines, and perennials, to shrubs like rock spray (*Cotoneaster horizontalis*). It is safe to say that there undoubtedly is a ground cover for every soil, condition, and need.

Perhaps the best known and most used are pachysandra (*Pachysandra terminalis*) and periwinkle (*Vinca minor*). The ones to be considered here are less known, but are dependable, and are attractive in the summer months.

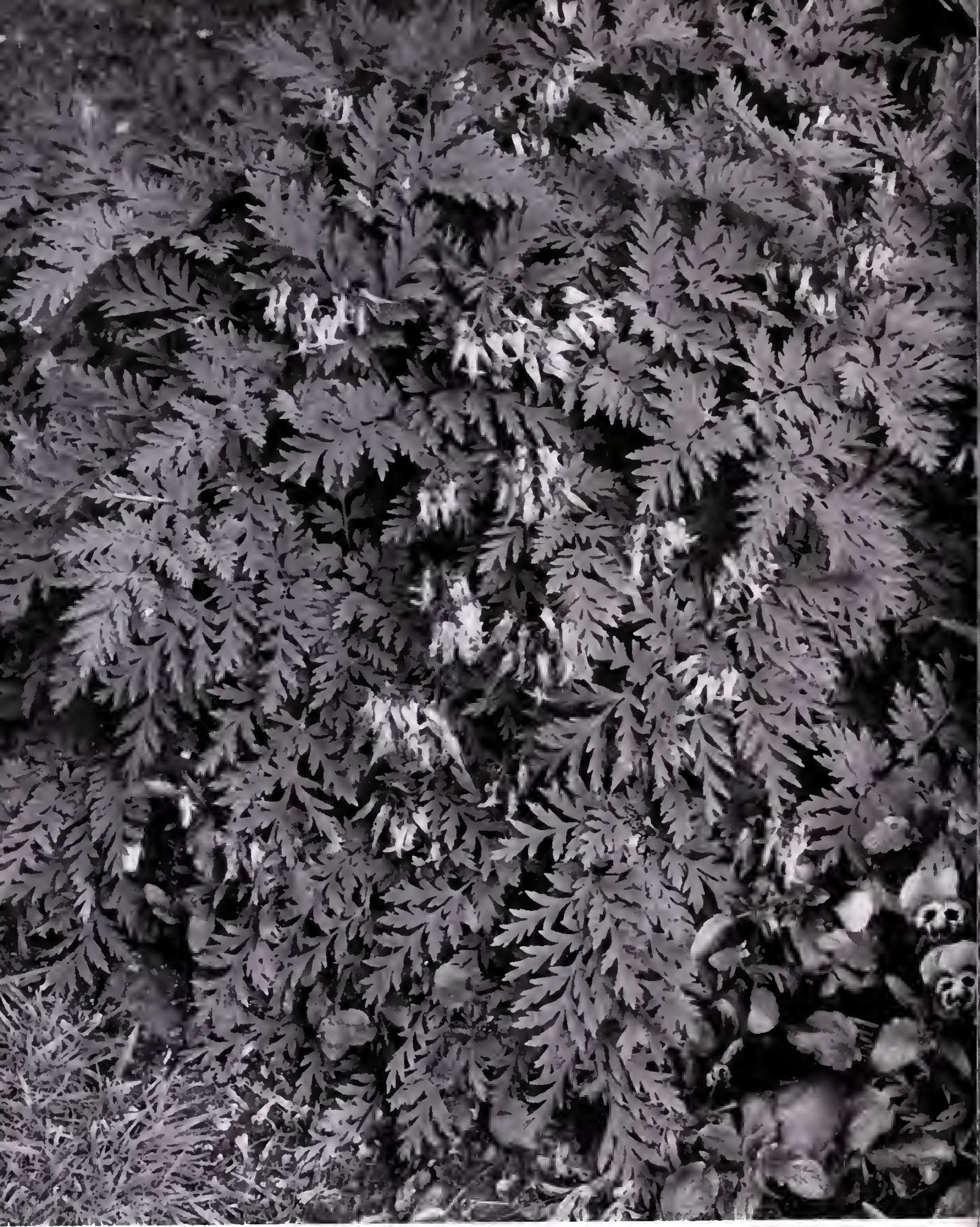
Perennials

Aster. For a showy mass of color the dwarf asters are good. Most of them flower late (in September), but the rock aster (*Aster alpinus*) blooms very early in the season (May and June) with violet heads on stems about 9 inches high. It is good interplanted with some of the later-blooming ones like Mauve Cushion, Countess of Dudley, Lilac Time, Snow Sprite, etc.

Bleeding-heart, the wild one (*Dicentra eximia*), blooms from May until frost. In the shade its flowers are pink. In the sun, where it also does well, the flowers fade to a bluish pink and are not nearly so attractive. The plant makes a low (1 foot) thick carpet of blue-green, deeply cut, attractive leaves.

The **bugle-weed** group (*Ajuga*) is one of the best, because it will grow in sun or shade, and requires practically no care. *Ajuga genevensis, Ajuga metalliea* var. *erispa* (with glossy, metallic-appearing leaves), the carpet bugleweed (*Ajuga reptans*), and *Ajuga reptans* var. *rubra* (with purple leaves), all have blue flowers in May and June, reach a height of 6 inches, and can be clipped with a lawn mower after flowering. *Ajuga genevenis* var. *rosea* grows at least 2 inches taller and has rosy pink flowers.

Coral-bells (*Heuchera sanguinea*). In rich soil, I have used this plant successfully as a ground cover, both in the sun and in partial shade. The scalloped leaves are very decorative; and the flowers are so useful in arrangements



McFarland phot

Wild bleeding-heart (*Dicentra eximia*)

that it is well to have a large planting to draw from, especially as they bloom a long time (through June and July in any case and throughout the summer if planted in the shade).

A kind of **cranesbill** (*Geranium platypetalum*) grows well in ordinary garden soil in the sun, and could be used oftener. It grows to about 15 inches, and blooms in July and August: showy deep violet flowers with purple veining.

Epimediums of various kinds deserve to be planted more frequently as ground covers. They are of interest from the very moment that their tiny bronze-colored new leaves first make their appearance in the spring. The leaves are toothed and veined attractively. The plants are charming individually; and in a group they are even more so, as they are pendulous, and form a continuous shield-like mass. As they grow best in partial shade, they are good for tree and shrub margins. They are easy to grow in average soil. The May- and June-blooming ones have long spurs somewhat like those of columbine, only smaller. These are the long-spur Epimedium (*Epimedium grandiflorum,* or *macranthum*), purple-red and white, and its varieties: *Epimedium grandiflorum* var. *niveum,* pure white, as lovely as any orchid, but much smaller; and *Epimedium grandiflorum* var. *roseum,* pale rose. The Persian Epimedium (*Epimedium pinnatum*) has shorter spurs than the *grandiflorum* group. The flowers are bright yellow, and the plant is hairy. *Epimedium pinnatum* var. *elegans* is also yellow but larger, and has more flowers. Both bloom in July and August.

Evening-primrose (*Oenothera missouriensis*), which needs to be planted in the sun, is an excellent trailer, and has large yellow blossoms from June through August.

Forget-me-not (*Myosotis scorpioides*) and its dwarf form (var. *semperflorens*) are good self-seeding biennials for marshy places, water margins, and moist shady places. They bloom in June and July.

Ground-ivy, or **gill-over-the-ground** (*Nepeta hederacea*), is a weed (but an attractive one) that blooms all summer, in sun or shade, and will stand mowing.

Iris. The Siberian (*Iris sibirica*), which blooms in June, and the Japanese (*Iris Kaempferi*), which blooms in July, make very good ground covers. When the rhizomes of the Siberian iris are planted individually rather than in clumps, they will make a mat so solid that not even elm seedlings can take root!

Forget-me-not (*Myosotis*) as ground cover

McFarland phot

Lily-of-the-valley (*Convallaria majalis*) needs no introduction, and is a little early for summer interest; but the pink form is lovely under flowering dogwood (*Cornus florida*).

Maiden pink (*Dianthus deltoides*) forms full tufts of flexible stems covered with small deep red flowers with a crimson eye, through the spring and early summer. The white form is *Dianthus deltoides alba.*

Moneywort, Creeping Jennie, or **Creeping Charlie** (*Lysimachia Nummularia*), is useful in the shade, and has yellow flowers that appear in June and continue into August.

Musk mallow (*Malva moschata*) grows to about 18 inches, and has flowers that range from rose to white, blooming in July.

Phlox. *Phlox stolonifera* (or *reptans*) is good with bulbs, used in the same way as the spring-blooming blue phlox (*Phlox divaricata*). The violet-colored flowers are formed in loose clusters on 6-inch stems. The body of the plant has a flat habit of growth.

Speedwell (*Veronica*). Some kinds are good for ground covers. *Veronica gentianoides* grows to about 2 feet, and has pale blue blossoms in May and June. It will grow in the shade as well as in the sun, but the others mentioned here do better in the sun. *Veronica incana* blossoms in July with deep blue flowers. It has silvery grey foliage which makes it interesting even when not in blossom. *Veronica rupestris* (*latifolia*) is very low, and makes a full show of light blue color in May and June.

Stonecrop or **live-for-ever** (*Sedum*). Most of this group make very good ground covers. *Sedum stoloniferum* does well in the shade, and in dry places; it has pink star-shaped flowers in July and August. Practically all the others do better in the sun. As stonecrops are very fleshy-leaved, they should not be planted near steps or stone work where they would make walking dangerous if trod upon.

Sundrop (*Oenothera fruticosa* var. *Youngii*) blooms profusely with many bright yellow flowers, and is doubly attractive because of its shiny foliage.

Sweet William (*Dianthus barbatus*) is more satisfactory as a ground cover than in a border. I sow it in place; it is a biennial.

Speedwell (*Veronica rupestris* or *latifolia*) as ground cover

McFarland

Thyme (*Thymus*) is invaluable because of a flat creeping habit and ability to stand up under mowing. Thymes are especially suitable around stepping stones and on terraces. Their fragrance is an asset, too. Creeping thyme or mother-of-thyme (*Thymus Serpyllum*) is wiry and can be walked on; its flowers are tiny and rose-lilac. *Thymus Serpyllum* var. *albus* is the white form; *Thymus Serpyllum* var. *coccineus* has bright crimson flowers and deep green foliage. Woolly thyme (*Thymus Serpyllum* var. *lanuginosus*) will not stand being walked on.

Tunic-flower (*Tunica Saxifraga*) is tufted, and somewhat like maiden pink in its growth habit. Its flowers are minute, white or lilac, and bloom all summer. The variety *flore pleno* has larger, pink flowers.

Vines

There are some vines that make a quick covering for banks and rocky places. The **porcelain vine** (*Ampelopsis brevipedunculata* var. *Maximowiczii*, or *Ampelopsis heterophylla*) is good for this, as it is not a clinging or climbing vine. It flowers in July and August, and has interesting bright blue berries in September. Several kinds of **clematis** are also good. *Clematis montana* var. *rubens*, which has pink blossoms in June and red foliage later, is another horizontal spreader. *Clematis paniculata* has a mass of heavy, white, late-summer bloom. It is a climber; but if it is heavily pruned each year it can be used as a ground cover. **Virgins-bower** (*Clematis virginiana*) has white flowers from July to September, and can be treated the same way. **Perennial** or **everlasting pea** (*Lathyrus latifolius*) has rose-colored blossoms (not fragrant) in August. The white form, *Lathyrus latifolius albus*, is very attractive. Both have a sprawling habit of growth, and should not be retransplanted.

The **memorial rose** (*Rosa Wichuraiana*) with its trailing habit of growth, dark glossy foliage, and white blossoms that start the last of May, is one of the roses for ground cover use, especially on banks. Several of the twining **honeysuckles** (*Lonicera*) are used by some as bank covers, but I hesitate to recommend them as they can be such pests in climbing on anything and everything they can reach.

Portulaca, an annual ground cover

McFarland photo

Photo courtesy of Clemson Colleg

Lawn of Bermuda grass and Kentucky bluegrass at Clemson College, South Carolina

LAWNS FOR THE SOUTH

Suitable grasses, and how to treat them. Something about Flawn for cooler regions

Winton H. Reinsmith

LAWNS in the South are a grief; yet they are regarded by almost everyone as near-indispensable. A good lawn, like a lot of other good things, occasions pains, trouble, and usually expense; how much depends on how high you set your standards. Let's say you demand only a reasonably good lawn. By a "good" lawn, I mean one with a solid catch, smooth texture, good color, reasonable purity and, of course, no bare patches or weed islands. Now, let's see what we can make out of what there is.

There is no need, here, of going into a lecture on the prodigious soil preparations you should make as a preliminary. The seed companies, turf experts, and certain government bulletins give you all that, and they are right. Throughout the South, lawn sites usually are not high in soil fertility; and vegetation works through a longer season than in the North, to sap what there is in the ground. So, if you set out your lawn on a site sketchily prepared, or not prefortified at all, you will pay the toll during the years your lawn endures, whether in inevitable seasonal fertilizings and waterings, or in the mediocrity which is so widely prevalent.

Choice of Grass

But let's assume that you do better than average; that you have some qualified person read the pH of your soil; that you add his prescribed plant food and humus; that you dig the site deep enough; that you eliminate the weeds and cement plaster; that you level and smooth it carefully, preparatory to seeding or sprigging in your chosen lawn grass. You have some choice as to grasses to use, though not a wide one, to be sure. Throughout the South generally there is one native grass that is used: Bermuda grass (*Cynodon Dactylon*). Along with it, in combination, rye grass (*Lolium*), domestic or imported, is used widely for winter-green effects. Then there is the handful of grasses each with restricted zones, limiting characteristics, and special features for special effects. These are St. Augustine grass (*Stenotaphrum secundatum*), carpet grass (*Axonopus compressus*), centipede grass (*Eremochloa ophiuroides*), Kentucky bluegrass (*Poa pratensis*), buffalo grass (*Buchloë dactyloides*), and "evergreen," which is a seedsman's mixture of several grasses more at home in northern States. Finally, there is "Flawn" (a name often used by dealers) or Manila grass (*Zoysia Matrella*), a tough, slow-filling turf grass that holds the greatest promise of all for permanence, universality, quality, durability, and sheer beauty. Because of several features to be discussed later, Zoysia has been slow of acceptance and establishment on southern lawns. In varying degrees, all these grasses except winter rye weaken or recede under tree shade or shallow tree root competition. They are all prodigious feeders and concede to weed competition when half-starved, except well-established Zoysia. They all require frequent mowings, occasional watering, and periodic weeding, except well-established Zoysia. All except rye, bluegrass, and "evergreen" are usually spread by planting roots, clumps, or runners, though Bermuda and carpet can be seeded. All except Zoysia are reasonably quick of establishment.

Bermuda Grass

For open, generally sunny sites, Bermuda is the most practicable, inexpensive long-range lawn grass. It is almost universally available; indeed in farming sections it is a pestiferous weed, tenaciously infesting patches of cultivated fields. Its roots are ubiquitous and deep; its stolons or runners are prolific. It loves new sites; and so, whether or not you fertilize, Bermuda will strike out bravely and soon occupy the site; more vigorously and solidly of course if you pour on the fertilizer. In a short time Bermuda attains its prime; in its prime, when regularly mowed, it is a soft-green, velvety sward well worthy of pains and pride. The problem is to hold it that way, sustain its prime. Bermuda immediately weakens under shade, even a little shade like that of overtopping weeds or the increasing canopy of those little specimen trees we set out in the lawn. When it weakens, the weeds seed in, such nuisances as Dallis grass and crab grass, dandelion and plantain; these spread out and displace the Bermuda. The holes left by hand- or hoe-weeding fill up with weeds before the Bermuda can spread in, unless you are quick with a dose of fertilizer. There is no need, here, of spreading the simple technique of planting Bermuda; every farm hand or yard man knows it well.

Although Bermuda roots spread rapidly and widely, this grass spreads itself most rapidly by means of aboveground stolons which put down roots at the nodes (joints). After Bermuda has filled in, it continues to put out these runners, new ones overtopping the earlier ones. Presently these new runners find no more room for anchorage; the lawn surface becomes an interlaced mass of loose strings; and the luxuriance of earlier times lapses into a stunted drab out of which mowing and fertilizing are slow to shake it. To correct or minimize this, you top-dress it with fine soil, up to an inch, each year; this rejuvenates the lawn, but also raises the level. Finally the turf is well above the level of walkways or driveways with which it started flush. Also the turf has stolen about one third of the bottom riser of any stairs it may bound. So, every 5 years or so, the assiduous lawn maker has it all dug up, weeds and runners removed, and the whole lawn restarted from the residual roots. So the Bermuda is off to another 5-year cycle of vigorous growth followed by interlacing, weeding, top-dressing, etc. This sequence is so labor-exacting, so expensive, that many lawn makers desist, just let it go, doing the best they can with fairly regular mowing and fertilizing. This may account for the generally mediocre Bermuda lawns and the mixed messes of many species, so widely manifest in the suburban and rural South. This is worthy of some stress here, for the same troubles and weaknesses are inescapable with St. Augustine and centipede lawns. There is a strain of fine-leaved Bermuda which is an interesting novelty, requiring more coaxing than Bermuda. Also, there is a variety coarser than Bermuda, called St. Lucie, which has limited usability on sand-hill sites in Florida.

Bermuda and its satellites assume a bright dead gray in their winter domancy, which extends from October to April. To fill in this drab gap, annual rye grass is used, sown in early fall, allowed to die out in hot late spring. Rye affords a beautiful, bright, artificial green luster to the lawn all winter, can be mowed, is indifferent to sun or shade. The trouble is, rye is a heavy feeder; unless annual feeding is done, the Bermuda base lapses the more rapidly into the limbo of mediocrity. Well-to-do people have their gardeners dig up in the fall and prepare for the rye seed; and dig up and feed up in the spring for the Bermuda summer lawn; but this is expensive.

Centipede Grass

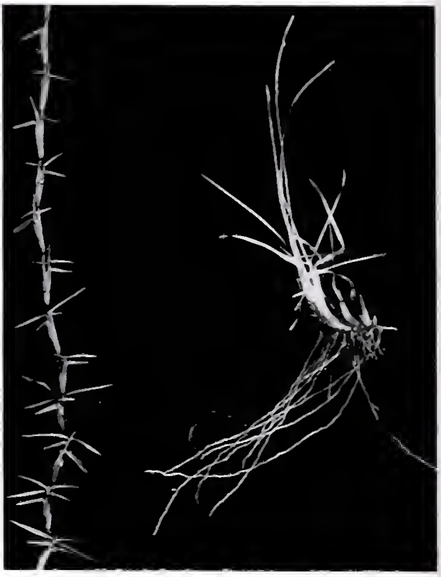


Photo courtesy of University of Florida

Centipede grass: left, runner; right, seed head, leaves, and roots

Centipede grass does well on prepared sites of sandy to clay soils below the latitudes of Charlotte, Atlanta, Birmingham, and Jackson. It is a little coarser than Bermuda, also a richer, darker green. On fresh sites it has tremendous spreading power. I recall one instance at Mountain Lake, Florida, where 4-inch squares of centipede sod were set 2 feet apart into a Bermuda lawn in checkerboard fashion. After 2 years of spot fertilizing the centipede squares, the Bermuda had virtually been displaced. Centipede is planted with sprigs or with pieces of sod. Its weaknesses are susceptibility to devastation by army worms, lack of hardiness below the low twenties, and an unfortunate reddish- to blackish-brown color for the winter, after freezing. It is of reasonably fine texture, however, fairly tolerant of shade, and it resists weed invasions if it is fairly well fed. A good centipede lawn is something of which to be proud; but one must be prepared to top-dress and renew it periodically.

St. Augustine Grass and Carpet Grass

St. Augustine grass long has been popular in Florida and the lower parts of the

Gulf States. It is a lot of trouble, first to last, but its thick turf well maintained is a rewarding sight. It is coarse, and readily becomes loose and stringy unless regularly top-dressed. It seems limited in hardiness to latitudes south of Augusta, Macon, Montgomery, Baton Rouge. It takes on a temporary reddish tinge after frosting. Its most serious weakness is its susceptibility to chinch bug; this makes frequent preventive contact sprayings a necessity in its culture. Propagation is by setting out runners.

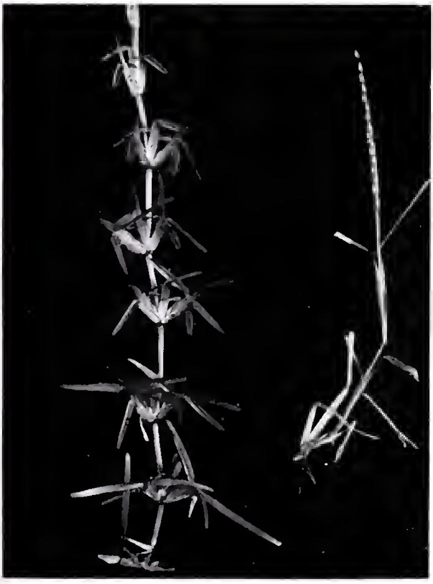
Carpet grass is a tough, coarse, native grass with about the same hardiness range as St. Augustine, but requiring heavier soil; it is better on muck-sandy than on clay bases. This grass can be sown and the seed easily gathered; but it takes several years to establish a good stand.

Kentucky Bluegrass and Buffalo Grass

Kentucky bluegrass is one of the finest lawn grasses, good in sun or shade, of fine texture, good color; but it prefers a sweet soil and does not abide subtropic heat very well. Its range in the South is confined to the bluegrass regions of Tennessee and Kentucky; and it has limited use in the southern Appalachian mountains and the upper Piedmont. It makes a useful component of formula seed grasses, such as evergreen."

St. Augustine grass: left, runner; right, seed head and leaves

Photo courtesy of University of Florida



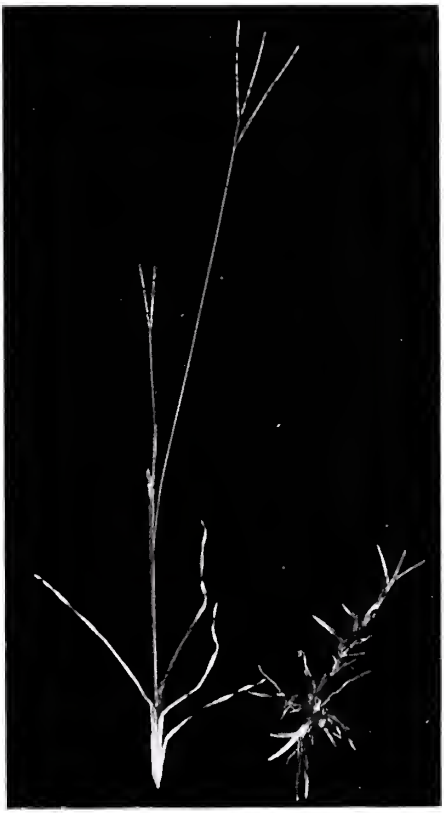


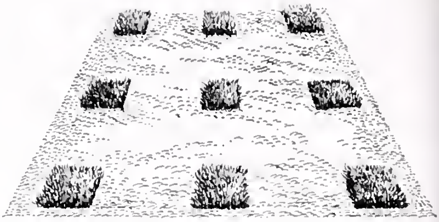
Photo courtesy of University of Florida

Carpet grass: left, runner; right, seed head and leaves

Buffalo grass is a native Westerner. In the dryer areas of Texas, Oklahoma, and the Southwest, it does better than most grasses. It is propagated by clumps, makes a pretty fair turf. Also, it can be seeded.

Zoysia

Flawn, or Manila grass, *Zoysia Matrella,* is a subtropic native with exceptional habits and powers. Native of the South Sea regions, Zoysia withstands any amount of tropic sun and heat, thrives on it. It tends to be evergreen in the deep South. Likewise, though dormant during even temperate winters, it has been known to withstand low temperatures, 18° below zero at an elevation of 2500 feet near Asheville, N.C. It has been established successfully in lower Connecticut, on Long Island,* in lower Ohio, eastern Oklahoma, and Missouri. Once established, Zoysia resists and crowds out weeds, resists droughts, is resilient under foot- or tire-wear, thrives in shade, never grows higher than 3½ inches, and responds to frequent mowings with a lush green and a fine texture. Best of all, thus far no injurious infestations are reported. The 2 or 3 disadvantages are its scarcity, slow spread, and high cost ($5 and up, per square yard of sod.) There is no seed on the market thus far. Zoysia sod ships well and is amenable to sane handling, but it has to be planted carefully. It can be planted by setting sprigs or sod blocks into a prepared clean site, or into an existing stand of Bermuda or other lawn, It is undergoing widespread experimentation thoughout the South on lawns, airfields, road banks, and at experiment stations. A well-established, pure lawn of Zoysia is a thing of beauty indeed, a wonderful carpet underfoot.



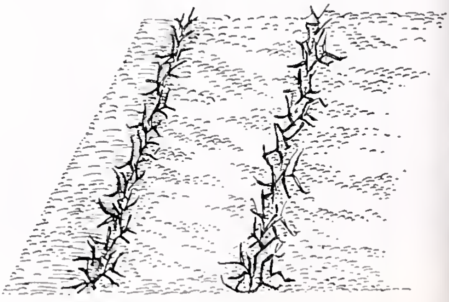
Blocks of Flawn sod 1½ inches square, planted 4 inches apart each way. By this method 1 square yard of Flawn sod will plant 12 square yards of lawn. A 30- × 50-foot lawn would require about 13 square yards of sod. (In the North 4-inch spacing is advisable, father south 6 to 8 inches.)

Apparently, once established, Zoysia promises permanence; it has no above-ground runners, needs no top-dressings. It is rhizomatous, i.e., it spreads by underground running stems, and makes a tight, thick, handleable sod. This lawn grass will bear watching. Leading seed companies can give detailed information about it. Thus far, its range potentially embraces the whole South and probably more.

Two slightly less desirable Zoysias also exist; the diminutive *Zoysia tenuifolia,* used in lower Florida patios; and *Zoysia japonica,* coarser and faster-spreading than *Z. Matrella,* very promising for airfields and road banks, and for the erosion-proofing of fields.

Thus, southern lawns remain major, costly landscape problems; but I suppose folks everywhere will continue to wrestle with them.

Flawn runners in rows 4 inches apart for northern lawns (6 to 8 inches apart for southern). This method of planting costs less for the Flawn but more for the labor than the block method



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* Flawn has been growing in the Brooklyn Botanic Garden for the past three years. In climate, western Long Island is fairly typical of the region within 100 miles, at least of areas close to the shore. Flawn has had little or no winterkilling; it has grown vigorously, and has made a fine turf; it is resistant to chinch bug. One possible drawback to planting it in many places in a cooler climate, where it is at the extreme of its range, is the fact that it begins to turn brown about October 15, and does not become green again until between May 1 and May 15.

Visitors at the Brooklyn Botanic Garden may see a demonstration planting of Flawn and other lawn grasses, together with common lawn weeds and methods of killing them.

THE GARDEN CENTER

What it is and what it does, in Cleveland, Ohio, and elsewhere

Arnold M. Davis

A PURELY American development in the field of gardening in the last 15 years has been the Garden Center. What it is and how it came into being are still puzzling to many. There are some scores of garden centers in the United States, and they range from a small botanical garden through a corner of a room in the local library to a complete modern fireproof building housing a horticultural library of several thousand volumes with exhibit auditorium and other technical facilities. The garden center in its broadest conception is a service organization for the community which supports it. To the harassed gardener who needs the assurance that what he is going to do is the right thing, a garden center is a great boon.

Service

To illustrate, the first week in January in Cleveland in the year 1946 might well have been an early April week as far as planting weather was concerned. Apparently a lot of our gardeners had failed to get their tulip bulbs planted, and The Garden Center was swamped with telephone calls, "Can I plant them now?". This is a simple illustration of the service such an organization can render in its community. Any infestation of insects brings on another burst of questions on control measures, etc. It is always possible to ask for help on definite problems through the season. Soil testing is another field where garden centers render a service; but of most importance is the interpretation of the test for the gardener, and definite recommendations which will assist in the growth of plants.

Many garden centers conduct trial gardens or demonstration gardens in which plants are grown for inspection and study on the part of the public. Such gardens are a source of inspiration and information to the serious. All garden centers offer some type of program, usually on a monthly basis, for their members and the public. To the garden clubs garden centers furnish a place for meetings and assistance in planning programs and projects. Garden centers, through their organization, also have a sense of responsibility for promotional developments in the community. Such developments may consist of tree planting programs, support of conservation movements, spread of knowledge in the field of city planning, and general cooperation with other educational institutions improving the educational opportunities of the community. The Garden Center of Greater Cleveland has taken the leadership and responsibility for the landscaping of Crile General Hospital in cooperation with the army. This represents a landscape project of tremendous size.

Support and Staff

Garden centers are supported primarily by membership, such support being in direct ratio to the amount of service which the organization renders. Usually an annual membership campaign is conducted, although many organizations operate on a year-round membership program. The staff of a garden center may consist of one individual or a series of individuals acting in various capacities such as director, librarian, or secretaries. The Cleveland Garden Center has a permanent staff of 4 people, with extra seasonal assistants. The Berkshire Garden Center, which is more of a small botanical garden, has a permanent staff of 2 people, a director and secretary, with seasonal labor to maintain their trial plantings. It is obvious that the training required for garden center management should be in the fields of basic horticulture, with information in the fields of landscape gardening, landscape architecture, and ornamental horticulture.

Future

It is the writer's opinion that as ornamental horticulture increases in its spread throughout our nation, more and more garden centers will develop. For this reason a field which now is small will continue to expand in the training of

Library, Garden Center of Greater Cleveland

Gottscho photo, courtesy of autho

Henry M. Mayer photo

Interior of library, Garden Center of Greater Cleveland

horticulturists for this type of work. A garden center should be able to justify its existence on the basis of the service which it can render to the community in the development of gardens, home landscaping, and civic programs. As all communities support the professions of medicine in varying degrees, these same communities will find it to their advantage to support unbiased horticultural organizations which can expand to fit the needs of the area that is served. The ideal garden center then becomes a clearing house for horticultural information serving the horticultural trade, that is the florist, the nurseryman and plantsman, the professional horticulturist, the landscape architect and landscape designer, and the landscape gardener, as well as the homeowner and the community, for the development of gardening.

APPLY 2-4-D WEED KILLER WHEN PLANTS ARE GROWING

Plants are most susceptible to killing by 2-4-D when they are in active growth; hence weeds are easier to kill in fertile soil and under moisture conditions that encourage rapid growth. They are more difficult to control as they become more mature.

This weed killer is effective over a wide range of temperatures. Its action is more rapid above 60° F.; at cooler temperatures it is just as effective, although slower—at least down to 40° F.; below this point good results should not be expected.

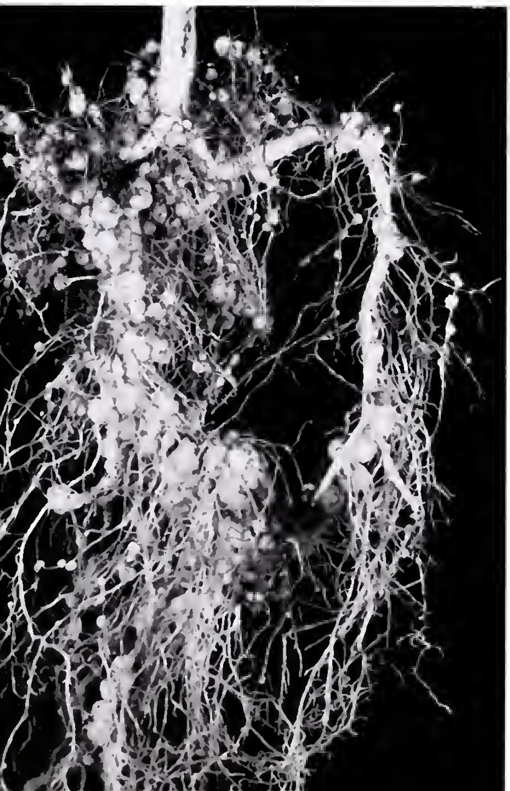
SOMETHING NEW—

VIRUS TUMORS IN PLANTS

Significant for cancer research. The work of Lindsay M. Black

Sally Kelly

A WEEK-END trip to Washington, to hunt insects, culminated in the discovery of a new disease, one that produces tumors in plants. The week-ender was Dr. L. M. Black, formerly of the Rockefeller Institute for Medical Research at Princeton, N. J., now of the Brooklyn Botanic Garden. A few of the forty-seven leaf-hopping insects his week-end trip yielded were harboring the agent which causes the new tumor disease.



Virus tumors on roots of a susceptible variety of sweet clover

Louis Buhle photo

Louis Buhle photo

The leaf hopper *Agallia constricta.* Magnified 11 times

Dr. Black took the bugs to his laboratory and allowed them to feed on clover. After many weeks he noted that the plants the insects fed on developed tumors—mostly on the roots, but occasionally on the stems and leaves. This was something new.

The cause was finally traced to one of the more "modern" disease producers—a virus. Other viruses are the agents that cause, in humans, such diseases as infantile paralysis, smallpox, and even the common cold. To get the tumor disease, plants must be infected with the newly found virus. This agent can be spread from plant to plant only via the leaf hoppers. They are the carriers, and they suffer no ill effects from their labors.

Research Methods

A visit to the laboratories is a revelation to anyone who does not know how

Louis Buhle photo

Dr. Black grafting part of a diseased plant on a healthy one

plant tumor research is carried on. An experimental greenhouse contains hundreds of test plants, clover, sorrel, tomato, etc. Some are healthy; others, recently infected with the tumor-producing virus, are in the incubation phase, and show no symptoms; still others are in advanced stages of the tumor disease.

Adjoining the experimental greenhouse is the insectary, where the virus-carrying bugs are reared from egg to adult. They are sheltered and fed systematically in rows of sanitary-looking celluloid cages, ventilated and screened with cheesecloth. The route from the greenhouse through the insectary is strictly a one-way affair; "the other way out" is the rule. No visitor may return to the greenhouse from the insectary, lest he unwittingly carry an unwanted, virus-laden leaf hopper with him.

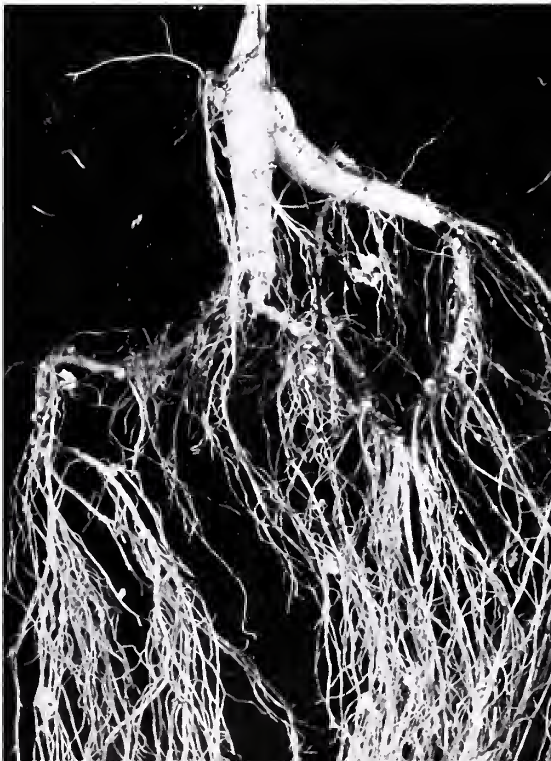
In the laboratories, far from the scene of infection, the tumors are studied. One person investigates their internal make-up; another keeps them growing continuously by means of new tissue-culture techniques.

Nature of the Disease

The disease has been more exactly termed "wound tumor"; that is, once the plants are infected, the tumors develop chiefly at the site of wounds. In roots there is much natural wounding: branch roots begin deep within the larger root, and grow out through its tissues—finally breaking through the surface. Most of the tumors appear at wounds made in this way. On stems, tumors sometimes appear where branches grow from the stem. Others develop where parts of the plant are injured from the outside, as by friction against the rim of a flower pot. All of these are regarded as natural wounds. Dr. Black verified this wound theory by experiment: he inflicted wounds by pricking the stems of both virus-infected and virus-free plants. The result: tumors at the punctures on infected plants, none on those virus-free.

Roots of a highly resistant variety of sweet clover; although the plant is invaded by the virus, something in its heredity inhibits tumor development

Louis Buhle photo



Many kinds of plants are susceptible to this newly discovered disease. Fifty different kinds have been given the disease experimentally; and it is likely that a great many more are susceptible. But here is the good news: by virtue of their heredity, many plants are more or less resistant to the wound-tumor virus. When several plants of the same kind were exposed to virus-carrying insects, some of them showed heavy cases of wound tumor, others mild symptoms. This test shows that heredity is important. Certain varieties are naturally resistant to the disease.

A word about the cause, the virus itself. The only visible signs of its presence are the tumors it produces. It can infect plants only after passing a few days in the bodies of its insect carriers (leaf hoppers with the scientific names of *Agallia constricta* and *Agalliopsis novella*). New infection takes place only when the insects, having previously fed on diseased plants, insert their tube-like mouths into the foliage of virus-free plants, much as the malaria-carrying mosquito does its work on humans.

Significance of the Disease

So far as is now known, this new disease is of no direct economic significance. The tumors are fairly slow-growing. Only when the roots are old and rotted with tumors do the plants die of the disease.

Working in the insectary. (In nature insects are the only means of transmitting the disease.)

Louis Buhle photo

Louis Buhle photo

Cage housing a plant and a leaf hopper carrying the virus. After a few days' feeding, the insect will have transmitted the virus to the plant

Its real significance lies in its importance for tumor research in general. Several tumors of animals, such as breast cancer of mice, kidney tumor of frogs, and many chicken tumors, are caused by virus infection. Wound-tumor of plants resembles breast cancer of mice in two ways. In both diseases, heredity determines in large part the tumor reaction of the individuals infected with the virus. In breast cancer of mice, hormones have an essential role; in wound-tumor, wounds start the tumors in diseased plants, and it is possible that "wound hormones" are involved. The possibility is still open that tumor producing viruses in animals may be carried by insects.

WITHIN THE BROOKLYN BOTANIC GARDEN

FEBRUARY SUMMER

Summer came in February this year for two members of the Garden's staff who traveled by boat and plane to Guatemala. The rainy season had ended there in November, and by February official summer was in full swing. Blue skies and bright sunshine—the equivalent of June in North America—were in sharp contrast with the cold gray winter left behind.

More surprising, however, was an unexpected similarity in the state of the vegetation. Pines, cypresses, live oaks, and certain other trees were green; but many kinds were leafless, as were those we had left in Brooklyn. Dooryard gardens and city parks flourished as far as the gardener's hose or water cart could go. But the native vegetation was in a resting state. Winter rains (in May) always start the new growing season.

Banana, coffee, pineapple, kapok, chicle, cane, and mango are among the foreign plants that flourish in the tropical greenhouse at the Botanic Garden. In Guatemala they were at home in native forests or in fields as far as the eye could see.

FRANCES M. MINER

Guatemala highway

Author photo

ROSE GARDEN DAY

The Rose Garden was a gift, in 1927, of Mr. and Mrs. Walter V. Cranford of Greenwich, Connecticut

The twentieth annual Rose Garden Day was celebrated on June 10, 1947. Mr. Paul Frese, Editor of the magazine *Flower Grower,* spoke on "Roses as I see them." Mr. Frese pointed out in his talk that roses constitute one of the most widely-grown groups of ornamental plants, with over 4800 species and varieties. They range from the Arctic Ocean to the tropics, and are admired the world over. Older varieties are continually being discarded in favor of newer ones: this constant change adds to their interest. The speaker called attention to the many types of roses—creepers, climbers, shrubs, miniatures—and some of their various uses. Some climbing types are very effective as ground covers, especially on banks. Some of the less vigorous climbers are often referred to as pillar roses; they are especially useful for training on posts as accent plants. The more vigorous-growing kinds of ramblers are suitable for fences, pergolas, and arbors. Usually roses of this type are pruned after they have flowered: the oldest wood is removed, and the new shoots are permitted to develop for flowering the next season. On some of the climbers which produce large flowers not in clusters, trimming out only part of the old wood is usually sufficient, if the faded flowers are removed from the remaining old wood. Many of the more shy-flowering of these large-flowered climbers, such as Doubloons, King Midas, and Golden Climber, can be induced to bloom more freely if trained horizontally rather than vertically.

The well-known hybrid tea roses were named as the prime selection for beautiful flowers in all colors. The hybrid perpetuals are larger-growing and more vigorous but do not possess the continual flowering habit of the hybrid teas. The floribunda type is a bedding rose and free-blooming. The miniature roses, such as Pixie and *Rosa Roulettii,* are ideal for dwarf edging plants, or in the rock garden, or for growing in pots.

Anyone interested in roses at all (said Mr. Frese) should not overlook the shrub and species roses, sometimes referred to as old-fashioned roses. There is much beauty and loveliness as well as history and sentiment in such kinds as Damask roses, the cabbage rose (*Rosa centifolia*), the moss roses, and the sweetbriers with their delightful fragrance of foliage. Many of the early pioneers brought roses from Europe, and took plants westward with them for their new homes, in Ohio, Iowa, or California. This is evidenced by the old rose bushes still growing and thriving in yards of long-deserted farm houses. Family interest in such plants still exists where gardeners maintain and grow, to pass on to their children, rose bushes which their parents or grandparents had once enjoyed. These old-fashioned roses have become living heirlooms.

A tour of the Rose Garden was conducted by Dr. Arthur H. Graves of the Garden Staff; and tea was served by the Garden Auxiliary.

CONRAD B. LINK

BROOKLYN BOTANIC GARDEN

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TO VISITORS

To reach the Garden:

By Subway: from Manhattan, twenty-five to thirty minutes' ride from Times Square or Grand Central: **I.R.T., West Side** (7th Avenue or Broadway–7th Avenue line), downtown express marked "News Lots Avenue" or "Flatbush Avenue," to Eastern Parkway–Brooklyn Museum Station; **I.R.T., East Side** (Lexington Avenue line), downtown express marked "New Lots Avenue" or "Utica Avenue" or "Atlantic Avenue," to Nevins Street, step across platform and change to 7th Avenue or Broadway–7th Avenue train; **B.M.T.** Brighton Beach train to Prospect Park Station.

By Automobile: from points on Long Island take Eastern Parkway westward, and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway; follow the Parkway to Washington Avenue, then turn right.

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Autumn, 1947

Plan for a Special Garden

—

utdoor Culture of Hardy Bulbs

—

Forcing Bulbs, Hardy and Tender

—

r Autumn Planting—

Tulips, Daffodils, Lilies and other bulbs

Perennials

—

A Winter Garden

. 3 NEW SERIES NO. 3

AMONG THE CONTRIBUTORS TO THIS ISSUE

William C. Brumbach, a manufacturer of Esterly, Pennsylvania, whose hobby is the growing of plants and the study of their culture.

Emily Read Cheston (Mrs. Edward), a garden lecturer and consultant of Ambler, Pennsylvania.

Silvia Hathaway Evans (Mrs. Harold) of Philadelphia, an amateur gardener who has met with great success in forcing bulbs.

Oscar Galeno, a native of Chile—the home of the bellflower—now resides in California.

Conrad B. Link, Horticulturist at the Brooklyn Botanic Garden.

Alan Macneil of North Springfield, Vermont, a grower of hardy lilies, and co-author (with Esther Macneil) of the recent book "Garden Lilies."

Louis S. Maugher, an experienced flower judge, staged daffodils for Hosea Waterer at the Philadelphia Flower Show for many years. He is now with Henry A. Dreer.

Americo Nemiccolo, a landscape architect of Marlboro, Massachusetts.

David Platt, Vice-president of Max Schling, Seedsmen, Inc., and President of the Men's Garden Club of New York.

Elmer C. Purdy, son and successor of the famous Carl Purdy, wild flower grower of Ukiah, California.

Dr. A. P. Saunders, Professor Emeritus at Hamilton College, Clinton, New York, well known to gardeners as a breeder of peonies.

Estelle L. Sharp of Berwyn, Pennsylvania, a garden consultant of long experience.

Gertrude M. Smith, a garden consultant of Montclair, New Jersey.

Alys Sutcliffe, in charge of the Rock Garden at the Brooklyn Botanic Garden.

Frances R. Williams (Mrs. Stillman P.) of Winchester, Massachusetts, an amateur gardener who has made a specialty of plantain-lilies.

PLANTS & GARDENS

Spring Adonis (*Adonis vernalis*)

NEW SERIES Autumn, 1947 VOL. 3—NO. 3

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JOHN C. WISTER, *Editor*

MICHALENA L. CARROLL and HESTER M. RUSK, *Assistant Editors*

Unless otherwise credited, photographs by Louis Buhle, Staff Photographer of the Botanic Garden; drawings by Michalena L. Carroll.

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Autumn—woodland section of the Botanic Garden

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN BOTANIC GARDEN
1000 WASHINGTON AVENUE
BROOKLYN 25, NEW YORK
TELEPHONE: MAIN 2-4433

Autumn, 1947

Friends of PLANTS & GARDENS:

Here at the Garden the trees are turning: autumn is coming to the City just as surely as to the wooded hills. Colors are not so gay as in the country, but Garden landscapes are mellowing; and as this is written a few leaves are beginning to fall.

Editor Wister has looked well ahead in planning this number of PLANTS & GARDENS. As he so well knows, it is necessary to act now for a successful spring garden.

Bulbs - the feature of this issue - abound with possibilities for almost every garden. They offer the first and last flowers of the growing season; and once properly planted, many kinds give repeat performances every spring for years on end - virtually without care.

For a botanical touch we should like to give our readers a "genealogical" story of some of the plant material in this issue; but to trace the parentage of the thousands of varieties of bulbous plants would be impossible. Hybridizing has been going on for centuries, and the records are few. But we do know that of a hundred kinds of tulips found growing in the wild in southeastern Europe and adjoining Asia, scarcely more than a dozen were the ancestors of all our cultivated types. And of narcissus - two dozen (or fewer) different wild species have given us thousands of diverse and beautiful cultivated forms.

Don't overlook the article on Brodiaea, or the one on tender bulbs for the house. These, as well as all the others, are brimful of information you will want.

For an especially refreshing article of general interest, be sure to read Estelle Sharp's "A Winter Garden."

Members of the Garden will be particularly interested in turning to page 190 ("Within the Garden") for the account of persons recently in the news. We have had staff losses through retirements, and other losses through death, that leave places not easily filled.

Sincerely yours,

George S. Avery, Jr.
Director

LANDSCAPE PLAN FOR A SPECIAL GARDEN

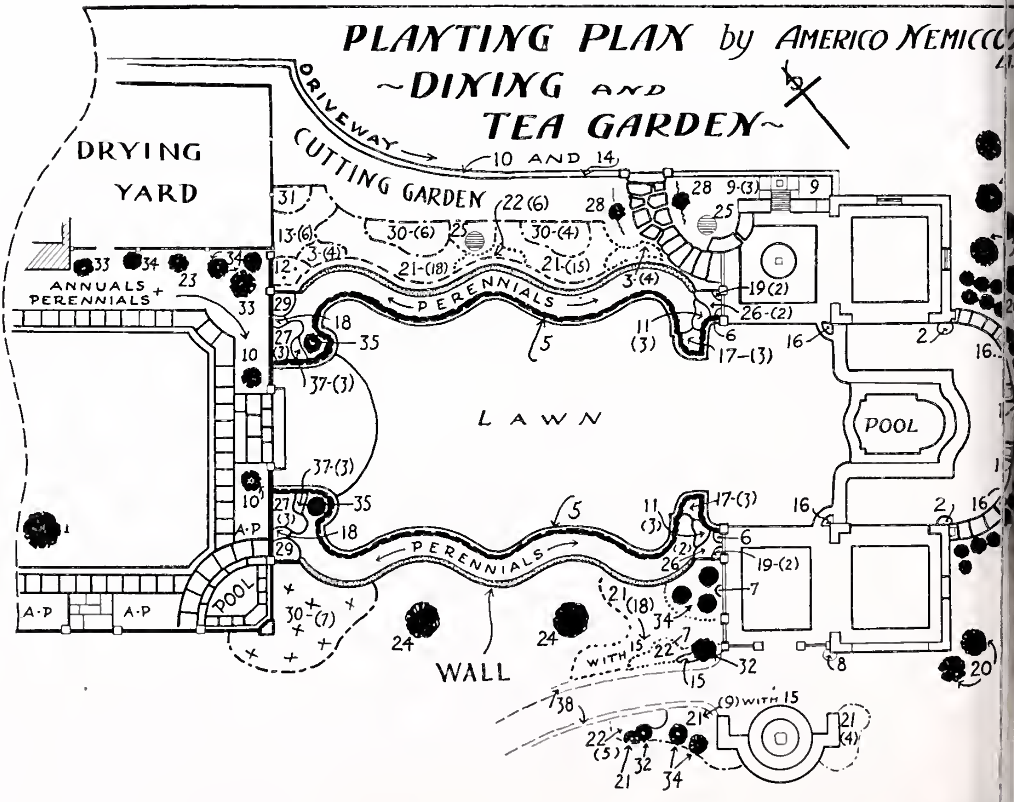
Arranged for convenience and for beauty

Americo Nemiccolo

THE basic principles of land use should be kept in mind in designing even the smallest outdoor area. The physical conditions control the design somewhat, but they can sometimes be changed to a considerable extent. The most important other factor is the purpose of the garden—whether it is to be a decorative pattern, a pattern of open spaces, or a place for a definite use, such as an outdoor living room, or dining room, or a combination of several requirements.

The garden of Mrs. William H. Beardsley of Springfield, Vermont had to be made in a fairly small rectangular area, sloping from the driveway on the east side of the house to a line a few feet west of the house. On the west there was a sudden drop—an almost perpendicular bank—to the street, more than 30 feet below. The view was of a valley well spotted with house tops, and beautiful hills beyond. There were several large trees on the place, only one of which had to be removed. It interfered with the design, and was the only one in poor condition; and so there were no regrets.

The owner desired an area for dining purposes, where tables and chairs could be used comfortably; another area for cooking and for picnics; two tea houses; a grass panel for badminton and other games; a pool for water-lilies and fish; and a pool to mirror the beautiful Vermont clouds and to be used for wading



Kinds of Plants Designated by the Numbers on the Plan

The figures in parentheses on the plan indicate the number of plants of a certain kind in a given area

Common Name—Scientific Name

1. Shadbush—*Amelanchier canadensis*
2. Virginia creeper—*Parthenocissus quinquefolia*
3. Azalea—*Rhododendron arborescens*
4. Canoe or paper birch—*Betula papyrifera*
5. Box—*Buxus sempervirens suffruticosa*
6. Clematis—*Clematis Lawsoniana* var. *Henryi*
7. Clematis—*Clematis Lawsoniana*
8. Clematis—*Clematis paniculata*
9. Spreading Cotoneaster—*Cotoneaster divaricata*
10. Rock spray—*Cotoneaster horizontalis*
11. Bleeding-heart—*Dicentra spectabilis*
12. Winged euonymus—*Euonymus alatus*
13. Euonymus—*Euonymus Bungeanus*
14. Euonymus—*Euonymus Fortunei* var. *radicans minimus*
15. Native ferns—*Polystichum* and others
16. Grape—*Vitis*
17. Edging or hardy candytuft—*Iberis sempervirens*
18. Siberian iris (blue)—*Iris sibirica*
19. Iris—*Iris pallida*

Common Name—Scientific Name

20. Red-cedar—*Juniperus virginiana*
21. Mountain-laurel—*Kalmia latifolia*
22. Drooping leucothoe—*Leucothoe Catesbaei*
23. Arnold's crab apple—*Malus floribunda* var. *Arnoldiana*
24. Crab apple Hyslop—*Malus*
25. Maple—*Acer*
26. Tree peony Reine Elizabeth—*Paeonia suffruticosa* (*Moutan*)
27. Peony—*Paeonia*
28. Pear (trained in cordon shape)—*Pyrus*
29. Mountain Pieris—*Pieris floribunda*
30. Carolina rhododendron—*Rhododendron carolinianum*
31. Rose bay—*Rhododendron maximum*
32. European mountain-ash—*Sorbus Aucuparia*
33. Japanese tree lilac—*Syringa amurensis* var. *japonica*
34. Common lilac—*Syringa vulgaris alba*
35. Japanese yew—*Taxus cuspidata nana*
36. Hemlock—*Tsuga canadensis*
37. Speedwell—*Veronica maritima* var. *subsessilis*
38. Common periwinkle—*Vinca minor*

A. P. Annuals and perennials

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by the grandchildren. The owner wished, also, to have permanent materials used as much as possible, to have plants for cutting as well as for decorative effect in the garden, and to have an overall effect of symmetry.

For the dining garden a random pattern of bluestone was designed, bordered with brick, surrounded by flower beds, and framed by perforated single brick walls. The walls give privacy, combined with ventilation and a feeling of openness within. The lily pool was put in the corner diagonally across from the house. The interest in the pool balances the heavy mass of the building. Espalliered shrubs were placed along the facades of the house and the latticed drying yard. These add interest, make a screen, and overcome the difficulties

Dining garden beyond serpentine wall
Photo by the autho

of growing more brittle plants where heavy slides of ice and snow come from the slate roof in winter.

The transition from this garden to the grass-paneled one is made by a low sloping brick wall, wide steps, and a large bluestone platform. A serpentine wall was used, to give a feeling of greater width and grace to the narrow paneled area, and at the same time to preserve the proportions of the garden. On the cut side the serpentine wall is backed by reenforced concrete to retain the bank where the maples, rhododendrons, and kalmia are growing. On the outside bays of the free-standing wall crab apple trees were planted. Flower beds, following the wall curves, have steel edges which preserve the shape and reduce maintenance labor. This area is terminated by a decorative reflecting pool on a slightly raised terrace, flanked by brick tea houses. A semicircular pergola makes the background, with brick seats fitting between the columns.

The cross axis directly in front of the pool is terminated on one side by a fireplace in the retaining wall, and a stairway leading to the driveway, tool shed, and garage. On the other side it is terminated by a semicircular wall of sitting height, overlooking the view. An additional feature here is the sundial, mounted on a millstone. The other millstone was worked into a design in front of the fireplace. Both these terraces and the tea houses were paved with slate in combination with bluestone.

The wall heights were planned to eliminate as much as possible the view of the buildings below. The grille work for the tea house windows is designed in a red clover motif, because red clover is the state flower of Vermont.

CULTURE NOTES FOR HARDY BULBS

Conrad B. Link

Soil

Kind. Almost any well-prepared soil will do, preferably a loam.

Drainage. The soil must be well drained—poor drainage results in winterkilling and rotting of bulbs.

Fertility. Add superphosphate or bone meal, 5 to 10 pounds per 100 square feet, at planting time. If the soil is generally poor, use a complete fertilizer, 3 to 4 pounds per 100 square feet. Fertilizers must be spaded or plowed in before bulbs are planted.

Organic Matter. If this is lacking in the soil, add leaf mold, peat, or well-rotted manure. Fresh manure may be used **only** if it can be applied several months in advance.

Time of Planting

Early planting insures a good root system before winter. Later-planted bulbs should be mulched.

August to September
- Autumn-crocus (*Colchicum*)
- Crocus (*Crocus*), autumn-blooming
- Sternbergia

September to November
- Camass (*Camassia*)
- Crocus, spring-blooming
- Glory-of-the-snow (*Chionodoxa*)
- Grape-hyacinth (*Muscari*)
- Fritillaria
- Hyacinth (*Hyacinthus*)
- Iris—bulbous
- Narcissus
- Snowdrop (*Galanthus*)
- Snowflake (*Leucojum*)

Squill (*Scilla*)
Star-of-Bethlehem (*Ornithogalum*)
Tulip (*Tulipa*)
Winter aconite (*Eranthis*)

Depth of Planting

A general rule is three times the diameter of the bulb. Slightly deeper planting is better in light, loose soil.

2–3 inches
Crocus
Star-of-Bethlehem
Winter aconite

3–4 inches
Autumn-crocus
Camass
Fritillaria
Glory-of-the-snow
Grape-hyacinth
Snowdrop
Snowflake
Squill

4–6 inches
Hyacinth
Iris

6–8 inches
Narcissus
Sternbergia
Tulip

Distance Apart

Small bulbs should be 3 to 4 inches apart; larger ones, such as hyacinth, tulip, and narcissus, 6 to 8 inches. Close planting gives a mass effect the first year, but bulbs are crowded and will not continue to thrive.

Where to Plant—a Few Suggestions

In the flower border: grape-hyacinths, tulips, narcissi, hyacinths, fritillarias, camassias.

In the rock garden: crocuses, snowdrops, glory-of-the-snow, star-of-Bethlehem, squills, winter aconite, small-flowered narcissi, tulip species.

In the shrub border: groups of either low-growing or tall-growing types.

Poets narcissus naturalized at the Botanic Garden

Naturalized in rough areas: narcissi, squills, crocuses, grape-hyacinths.

In lawns: Types with small, narrow foliage are best, such as crocuses, grape-hyacinths, squills, snowdrops. Larger-foliage types are also satisfactory, but the ripening leaves are unsightly.

In shady spots: narcissi, camassias, crocuses, squills.

In formal beds: tulips, hyacinths.

Care After Flowering

Allow the foliage to ripen (turn yellow) on the bulb.

Lift bulbs only when foliage has ripened; if bulbs must be moved earlier, transplant them carefully.

Remove old flowers and seed pods, especially from tulips, hyacinths, and narcissi.

When cutting flowers, do not remove more foliage than necessary. Leave at least half of it on the bulb.

BULBS FOR THE ROCK GARDEN

Flowers from early spring to late autumn

Alys Sutcliffe

THE flowering season of the rock garden is definitely prolonged by the use of the numerous small bulbs suitable for planting there. As far north as New York City, a mild January often sees flowers of the Palestine iris (*Iris Vartanii*), a bulbous iris; it may have to be covered during a cold spell, but it continues to flower for weeks when the cold has passed.

In February the early crocuses begin to bloom. Some of the first are *Crocus Korolkowii* and *Crocus vitellinus;* following these are many other species of crocuses which grow wild in countries

Snowdrops and early crocuses (*Crocus Tomasinianus*)

McFarland pho

around the Mediterranean. The one that grows and reproduces most readily here is *Crocus Tomasinianus;* it comes up under the trees and between the rocks, and covers the banks with its pale lavender flowers.

Everyone looks forward to seeing snowdrops (*Galanthus*), among the earliest flowers of spring. Their nodding white bells assure one that winter is nearly over, even if another fall of snow covers them again before spring actually arrives.

Winter aconite (*Eranthis hyemalis*), with shining yellow cups close to the ground, is also one of the first flowers of the year.

Narcissus Bulbocodium, cyclamineus, triandrus, and *minimus* (*N. Pseudo-Narcissus minimus*) are dainty species for the rock garden, but none of them is too hardy. They need a well-drained gritty soil in the shelter of a rock.

About the end of March the Siberian squill (*Scilla sibirica*) makes a vivid patch of blue-green color. The true hyacinth, *Hyacinthus ciliatus* (or *azureus*), looks very much like an early light blue edition of the grape-hyacinth (*Muscari*).

Before the grape-hyacinths flower, however, more of the bulbous irises are out: *Iris histrioides,* a dwarf light blue; and *Iris reticulata,* a rich dark blue with a violet fragrance.

Of the grape-hyacinths, *Muscari botryoides* and *Muscari racemosum* have proved the easiest to grow; they increase, both by bulb and by seed, to such an extent that in parts of a rock garden they can almost become weeds.

Several kinds of adders-tongue, or "dogs-tooth-violet" (*Erythronium*), native American bulbous plants, are valuable additions to any collection.

Also for spring bloom there are several kinds of fritillary. The best-known is snakes-head or checkered-lily (*Fritillaria meleagris*).

Tulip species give splashes of color to the rock garden late in the spring. They have great variety of color, shape, and size; but unfortunately, they are not very permanent. All tulip bulbs are special favorites of mice.

McFarland pho

Snakes-head (*Fritillaria meleagris*)

Also in late spring, snowflake (*Leucojum*) appears, with a stem about a foot high bearing many small white bell-like flowers.

Cyclamen europaeum and *Cyclamen neapolitanum,* miniatures of the well-known greenhouse cyclamen, are summer-flowering in this country. They are lovely, growing in partial shade in a soil of old lime rubble, peat, charcoal, sand, and leaf mold. They are more commonly grown from seed or bought as plants.

Towards the end of June and the beginning of July, the coral lily (*Lilium pumilum,* or *tenuifolium*) sends up slender stems not more than a foot high, with brilliant red flowers. It is a native of Siberia; the plants are not very long-lived, but are easily raised from seed.

To fill in the summer months with flowering bulbs, tiger-flowers (*Tigridia*) make a good showing—for those who wish to take the trouble. Natives of Mexico, they are not hardy in the North; they should be planted in April, lifted after the first frost and stored in a warm place for the winter. Related to the iris, the flowers themselves do not last long; but the bulbs are free-blooming, and flowering continues over a long period.

As fall approaches, bulbs still hold their own. Autumn-crocuses (not really *Crocus*, but *Colchicum*) seem to shoot up out of the ground and open their large crocus-like flowers of white, pink, and lavender. They can be planted in August and be in flower in a few weeks. About the same time *Sternbergia lutea* opens its solid-yellow cups like a patch of sunshine; the flowers look like very large crocuses, and the leaves remind one of narcissus.

Now come the true crocuses again, to end the year as they began it; there are many species of these fall-flowering crocuses. The saffron crocus (*Crocus sativus*) is one of them, so called because of the saffron coloring matter (used in cooking) made from it. The two that do best here are *Crocus speciosus* and *Crocus zonatus*. One wonders whether it is spring or fall when one suddenly comes upon a group of them standing in bright array. If the weather is mild, a few stragglers may linger until Christmas.

Narcissus Bulbocodium with *Narcissus triandrus* in background

McFarland photo

Tulip Classification

Species: the true tulip species, or forms of them; often listed in catalogs as Wild Tulips, or "Botanical" Tulips.

It is from these species tulips—those originally found growing wild in Asia—that all of the thousands of kinds of horticultural varieties have been developed. Tulips were introduced into Vienna from Turkey in 1554, and in the next few years into Holland and England. But these were not wild tulips; they were already garden flowers, and no one knows how long they had been cultivated. The origin of the tulip is unknown, and none of the ancient Turkish or Arabic herbals gives any indication of its parentage. The name *Tulipa Gesneriana,* which Linneaus gave the garden tulip in 1753, is really a group name for the garden varieties which existed at that time.

The **horticultural classification** of tulips is not very exact and probably can not be made so, because there are so many varieties which grade from one type into another. Distinction between classes is made on the basis of time of flowering, size, habit of growth, and parentage. In 1939 the Royal Horticultural Society of England published a tulip classification with more subdivisions than are listed here. The classes mentioned here are those most commonly found in bulb catalogs—those that the growers use in offering bulbs for sale.

Tulip Classes

Duc van Tol Tulips: very early and dwarf, usually not over 6 inches tall; not common.

Single Early Tulips: bloom in late April; plants and flowers are not so large as in later kinds. Many varieties of this class are used for forcing.

Double Early Tulips: similar to the single early tulips except that the flowers are double. The best double tulips are in this group.

Mendel Tulips: midseason; varieties in this group are the result of crossing Duc van Tol tulips with Darwins. They are intermediate between the parents both in growth and in time of flowering.

Triumph Tulips: midseason; a group of varieties obtained by crossing Single Early tulips and Darwins; somewhat stronger-growing than Mendel tulips.

A multi-flowered tulip

Cottage Tulips: flower in May, and have long stiff stems. This is a catch-all group including any varieties not fitting into other classes.

Lily-flowered Tulips: a group of Cottage tulips with long pointed petals that give a lily-like appearance when the flowers are fully open. They bloom at the same time as other Cottage tulips.

Multi-flowered Tulips: a small group of Cottage tulips producing three to six flowers on a branched flower stalk.

Darwin Tulips: long-stemmed, May-flowering varieties of solid colors. The flowers are generally globular, usually somewhat rectangular at base, and have heavy-bodied petals. Tall-growing, to 3 feet.

Breeder Tulips: May-flowering varieties with growth similar to the Darwins, but color range limited to blue, purple, lavender, old gold, rose, and bronze, often with a two-tone effect. Tall-growing, to 3 feet.

Parrot Tulips: varieties with fringed or deeply cut petals. Flower color either solid or marked with green or brown usually on the outside. The plants are not so tall-growing as Breeders or Darwins, and the stems are inclined to be weak.

Broken Tulips: varieties (belonging to any of the above groups) which show stripes, flecking, or feathering of red, rose, cerise, purple, or brown on a background of white or yellow. Usually referred to as Broken Cottage, Broken Breeder, or Rembrandt tulips (Broken Darwins).

Late Double Tulips: double-flowered forms including such names as Peony-flowered, Double, Double Triumph, and others; not so satisfactory as the early double tulips.

TULIPS IN THE GARDEN

Types and varieties for every use

Conrad B. Link

THE great brilliancy of spring color in the garden is provided by tulips. These plants are versatile in habit of growth and season of bloom as well as in size and color of the flowers. The color range in the flowers is practically the entire spectrum, except pure blue. This great variation gives the gardener an opportunity to use tulips in many ways.

In Formal Plantings

No other flower is so effective (except perhaps the hyacinth) for formal plantings. Formal effects are produced by planting the bulbs in regular geometric patterns, or irregularly in such a way that they appear about equal distances apart. Large beds of elaborate design, with squares, rectangles, triangles, circles, or more complicated patterns, are useful in large gardens. But in more modest gardens, groups of tulips are fine for color effect, even though used in smaller quantities. There may be a place for several long rows planted along a walk or driveway. One row is not very effective; but four or five rows, with the bulbs evenly spaced, make a long-remembered sight. In such plantings, usually only one variety or color is used; or if several are planted, they are arranged in groups or blocks to provide a pleasing combination or pattern of colors. It is important that the varieties be all of the same general class, and the same height. Tulips belonging to the Early Single and Double, Darwin, Cottage, and Breeder classes are most useful for such purpose.

McFarland photo

Species tulips (*Tulipa Clusiana*) in a rock garden

In order to produce flowers at the same height it is necessary to plant all of the bulbs at the same depth. After the ground has been prepared and raked, the rows may be marked out and holes made with a dibble. All of the holes should be of the same depth, and the bulbs of uniform size. Bulbs are spaced 5 to 8 inches apart. A more elaborate method, involving a considerable amount of labor, is to excavate the bed to a depth of 6 inches, place the bulbs, and then cover them with soil. If regularity of growth is not considered important, a trowel can be used for planting the bulbs; but it is difficult to make holes of uniform depth with a trowel. The plants will be at their best the first year. If the foliage is left to ripen, the bulbs will flower the next season. Annuals may be planted among the ripening leaves, and will soon cover the entire area.

For Cutting

Tulips are among the best flowers for cutting in the spring; and they should be placed in the garden where cutting will not spoil the picture value of the main plantings. The gardener who has an area set aside as a cutting garden is fortunate; but if cutting must be done from the regular plantings, the outdoor color display can be maintained by careful selection of the flowers to be cut. The tall-growing types, Cottage, Darwin, and Breeder, are ideal because of their long straight stems. The flower arrangement enthusiast enjoys using some of the less common types such as the Parrot varieties (see color plate), the lily-flowered tulips, and the "broken" tulips such as the Rembrandts and the Bybloems.

In the Flower Border

Masses or clumps of tulips provide the mainstay of color in the flower border during late April and May; and their place is taken by many herbaceous perennials and flowering shrubs in late May and June. All types are suitable; the taller-growing varieties are particularly effective in border plantings, but many of the smaller-growing tulip species also make a contribution. The taller ones are used toward the back of the border, the shorter ones at the front.

Species Tulips

The species tulips, or (as they are sometimes called) the "botanical," or wild tulips, are the most charming of this group of plants. They are most effective when planted in small clumps, and grow successfully in warm, rather dry locations. For these reasons they are especially well adapted for the rock garden; but many of the taller-growing species are a real addition to any flower border. The dwarf species, growing 6 to 10 inches tall, include *Tulipa australis, T. Hageri, T. Kaufmanniana, T. linifolia,* and *T. biflora* var. *turkestanica.* The taller-growing species, about 12 to 20 inches tall, include *Tulipa acuminata, T. chrysantha, T. Clusiana, T. Eichleri, T. Marjolettii, T. praestans, T. saxatilis,* and *T. sylvestris.* The colors of the species cover a considerable range; among them are brilliant reds, yellows, whites, and combinations of these colors. Species tulips are planted 6 to 8 inches deep, and will last for several years without being disturbed; but they will not succeed in poorly drained soil.

A tulip garden

McFarl

NEW AND SHOWY TULIPS

And suggestions on tulip culture

David Platt

WITH accent on "showy," this article will not deal with the fine lemure species and forms, but rather vith those hybrid forms that have been leveloped for size and color. Many of he newer forms seem to have escaped the notice of tulip fanciers whose tastes are oyal to the formal Darwin and Single Early types, and who look for variation only in the slightly daring Cottages and Breeders.

Parrot Tulips

The new Parrot tulips have demonstrated their acceptability for several years past; the variety Fantasy is the most popular tulip in the United States today, from the standpoint of sales. Fantasy and its companions, Therese (a soft red), Blue Parrot (a deep lavender), Orange Favorite, and Sunshine (a deep yellow), have attained popularity because of their departure from the old-fashioned Parrot forms, which at best, presented mildly exotic but flopping blossoms with stems of very poor substance. These old forms were not suitable for garden show, and were valuable only for flowers to float in water, because of their habit of snapping off directly below the blossom. The new forms are robust, with petals of strong substance; they make a fine garden show, and also provide splendid material for arrangements.

Double Late Tulips

Next in importance and popularity among the new forms are those in the Double Late class, a comparatively new addition sometimes spoken of as "peony-flowered." These tulips do, in some measure, resemble peonies; and a vase of Mt. Tacoma (a large lovely white) and Uncle Tom (deep mahogany-maroon) will certainly fool all but the initiate. There are double Triumph forms which are not very late; but one of the Triumph varieties, Livingstone (a vivid cerise), is really a very striking flower. The Double Cottage forms are the best, from my observation; and while there are few good varieties at present, I can confidently predict (judging from my trials of this past spring) that the newer varieties such as Grand National, Vincent Van Gogh, Ruysdaels, Mayblossom, and Lilac Queen will attain a popularity previously enjoyed only by such old stalwarts as Clara Butt, City of Haarlem, Pride of Haarlem, and Louis XIV. These new ones will not be available for a few years, but they are worth waiting for.

Lily-flowered Tulips

Tulips in the Lily-flowered class (a variant from the Cottages) are indeed charming and practical. Some of the varieties, particularly White Cross and The Bride, can hardly be beaten, even by the conventional whites. They have purity and substance, which is all that can be asked of a white tulip; and they can be utilized with conventional forms. Other lovely varieties are Astor (a pale salmon), Sidonie (a lovely royal purple), Rhodes (rose-pink), Golden Emblem (yellow), and Maytime (a finely-cut lilac-purple of exquisite form).

Species and Species Hybrids

Among the species and species hybrids, *Tulipa Fosteriana* Mme. Lefeber (or Red Emperor) has ruled as the darling of those who appreciate boldness and blatancy in the early spring garden. It is true that this huge-blooming brilliant scarlet tulip is unequaled as a source of bold color at a time when nothing else in the garden can provide it; but its newer cousin, the variety Princeps, is rapidly becoming a greater favorite because of its later habit, superior reliability, and more subdued color. While Red Emperor can be said to shriek in flaming brilliance, Princeps glows like a spent ember. A third member of the Fosteriana group, Flaming Youth, is inadequate because of its ungainly foliage and short-lived bloom.

The *Tulipa Kaufmanniana* hybrids are really outstanding for show. I have been enchanted by Cesar Franck (a deep yellow striped red), Scarlet Elegance (a delightful brilliant scarlet), Vivaldi (deepest pink and cream), and Gaiety, the true water-lily tulip.

The *Tulipa praestans* group has produced Fusilier, a gorgeous multiple-flowered tulip with blossoms the size of pigeon eggs, four or five on a stem, in a brilliant vermilion; while the *Tulipa Greigii* group has produced at least one very unusual variety, Orange Gem.

Tulips and pansies

McFarland

The new species hybrids make it possible to use these extremely early-flowering types in flower beds and groups rather than confining them to the alpine garden. Beds of these interspersed with violas, polyanthus primroses, rock-cress (*Arabis*), and forget-me-not (*Myosotis*) make the most distinctive flower groups imaginable; and such beds are extremely practical for summer use, as well, because annuals can be planted in the same locations early.

Triumph Tulips

A comparatively new class of tulip that is slow in gaining recognition in this country is the Triumph tulip, developed mainly since the last war. This class consists, for the most part, of hybrids of Single Early and Darwin tulips. These are distinguished by their sturdy stems and large blossoms, chalice-like when open, closing to beautiful conical buds at night. I like the Triumphs because they last so long. They are intermediate-blooming, coming between the early- and the late-blooming tulip classes. The stems average 16 inches in height; and the class encompasses all of the finer shades, with many lovely bicolor combinations of pink and white. Two reds in this class, Olaf and Red Planet, are really superior varieties; while Northern Queen, a lovely pink with white base, has already become popular. It is strange that, in order to popularize the latter variety, it was deemed necessary to classify it as a Cottage to prevent its being passed over. All varieties in the Triumph class are excellent for forcing.

Mention must be made of two rather freakish orphan varieties, Advance and Demeter. Advance is a Cottage tulip, but it blooms at least two weeks before any other of its class. It is an outstanding variety, lovely rose-scarlet on the outside and poppy-red on the inside. Because of its unorthodox blooming date and its tall stems, it must always be planted by itself where it will reign in solitary grandeur. Demeter is a lovely royal purple; and while it is a true Darwin, it also is unorthodox in its early bloom. I like both of these varieties and recommend them highly.

Tulip Culture

There have been so many conflicting opinions on tulip culture, that I believe some of my experience may contribute to a workable alloy.

Depth is a matter of much importance. Large bulbs, 5 inches or over, should be planted as deep as the depth of the topsoil will allow. For example, if the topsoil is 12 inches deep the bulbs can go down 8 to 9 inches. If fortunately the topsoil is still deeper, the bulbs can go as deep as 10 inches or more, providing there is good soil 3 to 4 inches deep under their bases. Bulbs of smaller size can be planted proportionately less deep; but for best results no flowering bulb should be planted shallower than 6 inches.

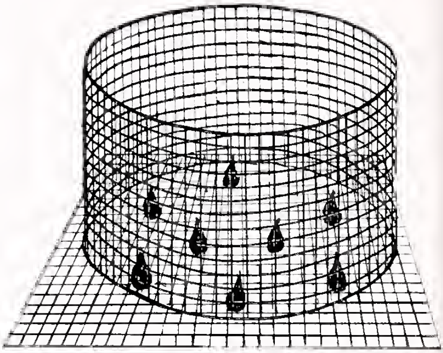
Poorer soils, shallower than 12 inches, should be improved if fine-quality blossoms are desired. A twelve-inch topsoil is really minimum for best quality; in fact double trenching is fine practice and is heartily recommended.

Deep planting prevents the splitting up of large bulbs, and eliminates the necessity of digging them up each year. By the same token, smaller bulbs will perform satisfactorily for one or two years longer if they are planted at the proper depth. Deep planting is also an effective method of controlling damage by moles and field mice.

It is a great help to add bone meal to the soil, with or without a dehydrated organic fertilizer low in nitrogen. These should be thoroughly mixed with the soil that will lie below the tulip bulbs. A top-dressing of a 5–10–5 fertilizer in early spring is also beneficial. Above all, ample watering during the growing period is important. The use of a soil soaker or one of the wand affairs is ideal, as this will avoid wetting the foliage. Wetting the leaves is not serious, however, if it is done in the morning of a sunny day.

Mulching is a necessity only in far-northern sections, or in temperate sections if the bulbs have been planted after November 20. Salt hay is the best mulch; but excelsior, glass wool, clean oak leaves, and peat-moss are all good. Mulches should be removed as soon as the tops appear above ground.

Before the tulips have shown their buds, and immediately after they have bloomed, a spraying of Bordeaux Mixture or Fermate will go a long way toward preventing the invasion of fire blight and botrytis, the two scourges of tulips.



Ed. Note: To protect bulbs from mice and moles—a simple device made of hardware cloth (¼-inch mesh). Top of wire should be about an inch below surface of soil

A tulip border

McFarland

HOW TO FORCE HARDY BULBS

Detailed directions for the amateur

Emily Read Cheston

EVERYONE knows how pleasant it is to have spring indoors while late winter snow is still piled at the threshold. It is now possible to buy good varieties of hardy or Dutch bulbs suitable for forcing under home conditions. And the results are almost certain to be satisfactory if two requirements are observed: forcing varieties must be chosen, and bulbs must be allowed to make strong root growth before being brought into light and heat.

In the garden, hardy bulbs are planted in the autumn, develop a strong root system during the winter, and come into bloom in the spring when the weather is cool and damp. For success in the house these conditions must be artificially reproduced. Bulbs should be potted in October or November, well watered, covered, and kept in a cold place from two to three months. When the pots are well filled with roots, they should be brought inside, and kept in a cool, dimly lighted place, until the tops turn green and are several inches high. Then they should be moved into sunlight, but if possible, still kept at a cool temperature. This general procedure is the same for all hardy bulbs.

Potting and Storing

Bulbs are undemanding about soil; their chief requirement is good drainage. Three parts of garden soil to one of sand will do; but a better mixture consists of six parts of good garden soil, four of coarse sand, and three of leaf mold, well sifted, with bone meal added at the rate of a cup to a half-bushel of soil (or a tablespoonful to a 4-inch pot). Where soil cannot be obtained, prepared fiber may be used—well moistened and packed tight about the bulbs.

Bulb pans are usually preferred, but any pot will do, provided it is clean and moist. Drainage material should be put in the bottom, then the soil; the bulbs should be set so that their tops will be covered with about ½ inch of soil. Watering will be easier if the soil does not reach the rim of the pot. It is best to stand each pot in water and let it absorb as much as the soil will hold. Wooden labels with name of variety, date, etc., are convenient; but as these may break, it is well also to write heavily with pencil on the rim of the pot, and make a chart showing where different varieties are placed in storage.

A cold, damp cellar, a garage, or even an attic may be made to serve; but the bulbs will root better out of doors, in a trench, or a cold frame, or a bottomless wooden box sunk to the rim in the ground. Actual freezing does no harm. Pots should be placed on some form of drainage material such as cinders, and should be surrounded and covered to a depth of 6 to 8 inches by dried leaves, straw, salt hay, cinders, or (easiest) peat-moss. Earth should be avoided because it is difficult to handle when frozen. Boards or old carpet placed over the top will make final handling easier. Where there is danger from mice, pots other than those of narcissus should be thoroughly protected by fine-mesh wire (mice do not eat narcissus bulbs).

Potted bulbs in cold frame

From the time the pots are covered until they are filled with roots, they require no care; but it is wise to inspect them occasionally, to be sure that the soil is moist. If the pots are kept indoors, the loss of moisture is so steady that they need water usually every week, and in many cases twice a week.

It is impossible to state exactly how long it will take for roots to form; the time varies with the variety. Certain of the early tulips may root in about four weeks; but eight to twelve weeks is a better general calculation. Sometimes roots push through the drainage hole; but if they do not, the pot should be knocked free and the ball of earth examined. When a close network of roots shows on the outside of the ball, the bulbs are ready to be taken inside. Care must be taken not to injure the delicate shoots which are pushing through the soil. Examinations and final removal should be made on mild days, because a sharp chill may blast or stunt the flower buds.

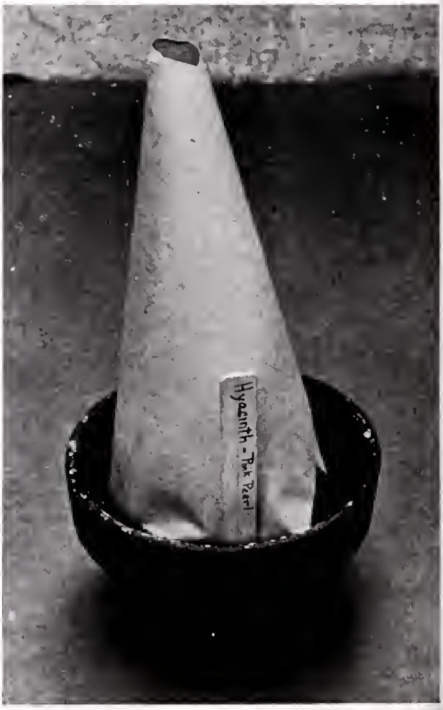
Indoor Care

When they are first brought in, the pots should be put where the light is dim and the temperature is under 50°F. They should be well watered at once and kept moist afterwards.

In some varieties the shoots turn green and begin to show real growth in a few days; in others this takes two weeks. The pots are then ready to be placed in stronger light. Direct sunshine is needed for the best bloom: in any case the plants should have the brightest light that is available. The best temperature is between 50° and 60°F. Too much warmth causes the buds to open too quickly and to last but a short time. In a cool place, each pot usually remains in effective bloom from ten days to two weeks.

Moving the pots from their first position before growth is active may make the flowers dwarfed or imperfect; leaving them in dim light too long tends to make the stems spindly and weak. If

Paper cone over hyacinth hastens lengthening of stem



a succession of bloom is desired, some pots may be left longer in storage and brought in as needed. In making calculations, one must understand that the nearer it is to spring, the more quickly the bulbs will come into flower after being placed in the light.

Care after Blooming

Generally speaking, bulbs cannot be successfully forced a second year in the house; but if they have proper care after blooming, they may be planted outside and will bloom well. This care consists in keeping the plants in the light and giving them plenty of water until the top growth has ripened; direct sunlight is not necessary. At this stage, the plants will stand a considerable amount of cold; and as the leaves begin to wither, the pots may safely be set outside in a protected place. When the top growth has dried, the soil may be allowed to dry, and the pots laid on their sides until the bulbs can be planted. They should be set comparatively deep; and the earlier they are put in the ground, the better they will do.

Hyacinths

Large bulbs (over 2 inches in diameter) may be placed one in a 4-inch pot, three in a 5-inch pot, or four in a 6-inch pan. Hyacinths usually take from ten to twelve weeks to make adequate root growth; but they may come into bloom in a week or ten days after they are brought into the house. They have a tendency to bloom before the stalks are properly developed; but a paper cone with a hole at the top, placed over the stem, will hasten its lengthening; the cone should be removed when the stem is about 3 inches high. If staking is necessary, slender green stakes set directly in the bulb close to the stem, are inconspicuous and will do no harm. Hyacinths are an exception to the general rule that bulbs cannot be forced a second year. The blossoms will not be so large as the first year; but if the largest-sized bulbs are bought and proper care is given after flowering, the pots may be laid on their sides until the autumn, then well watered and placed in storage as if they contained new bulbs. If bulbs are to be used a second time, it is particularly important to add bone meal to the potting mixture. Some of the best forcing varieties are:

L'Innocence: early, pure white.
Pink Pearl: very early, rose-pink.
La Victoire: brilliant carmine-red.
Lady Derby: pale salmon-pink.
Bismarck: early, light blue.
Perle Brilliant: lavender-blue.
King of the Blues: late, dark blue.
Prince Henry: early, clear yellow.
Yellow Hammer: golden yellow.
Queen of the Whites, Queen of the Pinks,

Forced hyacinths

and Queen of the Blues are excellent and late.

Daylight: salmon-yellow; particularly good because it is attractive even after it fades.

Miniature hyacinths are also excellent for forcing. They are smaller and more graceful than the large sizes and much resemble Roman hyacinths, which are not hardy.

Hyacinths may also be grown, somewhat less effectively, in water. They need storage in the dark, in a cool place where they will not freeze, until the roots are well grown; then the treatment is the same as for those grown in soil. Bulbs grown in water cannot be used a second time. The smaller single varieties do better in water than the larger ones.

Poetaz narcissus Laurens Koster

McFarland photo

Narcissi

Bulbs should be placed as close together as possible. Double-nosed ones give excellent results. Narcissus bulbs take a comparatively long time to bloom after being brought into the house. The length of their stems may be somewhat regulated by the time the bulbs are kept in dim light. Following are some of the outstanding varieties which force well:

Trumpets

King Alfred: early, clear golden-yellow.

Golden Harvest: very early; good form; uniform yellow.

Golden Spur: very early, rich deep yellow.

Victoria: erect flower, white with yellow trumpet.

Incomparabilis

Carlton: frilled crown, clear yellow.

John Evelyn: ivory perianth, strong yellow cup.

Barri

Lady Diana Manners: white, with flat orange cup.

Lady Moore: creamy white, with golden yellow cup.

Poetaz (Tazetta)

Geranium: early; strong stem bearing 4 to 6 flowers with broad white "petals" and scarlet cup.

Early Perfection: large flower, pure white with yellow cup.

Laurens Koster: tall; rounded white perianth, pale yellow cup.

Scarlet Gem: free-flowering; yellow perianth, scarlet cup.

Jonquils

Practically all of this group force well; but they are particularly sensitive to too much sudden heat. They have grass-like foliage and small clear yellow flowers, several on a stem, with delicious fragrance. The Campernelle varieties, both single and double, are excellent. Orange Queen is a golden orange, with three to four flowers on a stem. Trevithian, slightly taller, has two to three flowers of pale yellow.

Others

Many of the small narcissi, usually grown in rock gardens, force well. The hoop daffodil (*Narcissus Bulbocodium* var. *conspicuus*), *N. triandrus*, *N. minimus* (or *N. Pseudo-Narcissus minimus*), and Thalia are recommended.

Tulips

Three bulbs in a 4-inch pot or five in a 6-inch pan give good effect. The first leaf develops directly above the flat side of the bulb; hence the leaves will be better distributed and the whole pot will look better if the bulbs are planted with the flat side out. The bulbs require careful protection, because mice will eat them in preference to any other kind. Single early tulips are usually planted six in a 5-inch pot, nine in a 6-inch pan, etc. The doubles and Darwins require more space, six in a 6-inch pan or eleven in an 8-inch pan.

The quickest to force are the short-stemmed, listed as Early Single or Double; Darwin, Cottage, and Breeder are taller and usually require staking; they take a long time to root. Not all varieties force equally well, but the following are recommended:

Early Single
- Brilliant Star: bright red.
- Proserpine: rose-pink, early.
- Le Reve (Hobbema): old rose, tinged buff.
- Ibis: deep rose-pink.
- King of the Yellows: golden-yellow.
- Mon Tresor: pure yellow.
- General de Wet: brilliant orange, fragrant.
- Prince of Austria: orange-scarlet, sweet-scented.
- Fred Moore: terra-cotta and orange, fragrant.

Early Double
- Murillo: white, flushed pink.
- Golden Murillo: yellow, large.
- Electra: purple.
- Peach Blossom: deep pink.
- Vuurbank: scarlet.

Cottage
- Albino: large, pure white.
- Inglescombe: yellow, strong-stemmed.
- Mrs. Moon: clear yellow.
- Pride of Inglescombe: open white, turn pink.

Darwin
- Bartigon: crimson; medium height, strong stem.
- Clara Butt: watermelon-pink.
- Demeter: dark violet-blue.
- Princess Elisabeth: vivid pink.
- William Pitt: scarlet.
- William Copland: lilac, comparatively early.

Breeder
- Cardinal Manning: large, purple with copper.
- Louis XIV: dark purple, late.
- Indian Chief: coppery brown; strong stem.

Triumph

These tulips are new. They are crosses of Single Early and Darwin. They are good forcers, but take about two weeks longer than the early tulips. They are of medium height, with strong stems.

Steps in potting of tulip bulbs

McFarland photo

Crocus Remembrance—forced

Miscellaneous Bulbs

The early spring bulbs such as snowdrops, crocuses, and squills (*Scilla*) can all be forced in the house. As the flowers are small, a better effect will be produced if the bulbs are planted close together. The ones that come early outside, such as snowdrops and squills, force very quickly. Crocuses are particularly dependent on cool growing conditions. They do not last long in bloom; and it is well to choose some of the free-blooming varieties such as Maximilian, China Blue, and Remembrance, all of which are large, of good height, and blue; or White Snowstorm. Grape-hyacinths (*Muscari*) last well; but in many varieties, the foliage becomes so coarse that it hides the flowers. *Muscari botryoides*, white or blue, is the best. The fritillary, or "guinea-hen flower" (*Fritillaria meleagris*), also forces well. These small-flowering bulbs are as interesting as the well-known tulips, hyacinths, and narcissi.

Crocuses naturalized in lawn at Brooklyn Botanic Garden

DAFFODILS FOR EXHIBITION

What qualities are most important

L. S. Maugher

THE keen interest of gardening organizations in the modern daffodil is manifested in the many exhibitions featuring it each spring. There is somewhat less activity with this fine flower than with the rose, the iris, the gladiolus, and the dahlia; but this fact is probably due to scarcity of good material rather than to lack of enthusiasm.

For many years the development of the daffodil has centered in England and Holland; and because of the embargo against importation (except for propagation), the many fine new varieties have been available only in small lots and at very high prices. Consequently, in the few years prior to the recent war, it was only at the larger shows that one could see specimens of such daffodils such as Beersheba, Lord Wellington, Fortune, Carlton, Daisy Schaeffer, Trevithian, and other varieties which are now plentiful at very reasonable prices.

The real daffodil enthusiast, of course, keeps in touch with the hybridizers and growers in all parts of western Europe and this country, and is willing to pay a high price for new and improved varieties available only in extremely limited quantities; to such a person, the daffodils offered in most of the regular bulb-dealers' catalogues are old and well known. But the success of most daffodil shows depends upon the many gardeners and club members who must use varieties that are readily available at reasonable prices. On the other hand, it should be a matter of pride for anyone to introduce to his own community the newer and better varieties; and there is nothing more likely to repay a person than an investment in daffodil bulbs. They are almost certain to thrive under any ordinary conditions, and to increase and last indefinitely with a minimum of care and labor.

Price versus Quality

It is not at all necessary that high prices be paid for daffodils suitable for exhibition, as many fine varieties are in good supply and are offered by all dealers. I well remember a show some years ago, where a blossom of Silver Star was judged better than one of Gertie Millar, for which the exhibitor had paid a very high price. This naturally raised the question of the value of newer varieties if they were not to be judged better than older ones. Many factors contribute toward making varieties valuable for exhibition. The price of daffodils depends upon their rate of increase, and the demand for them, regardless of any other value they may

Barri narcissus with flat perianth and shallow cup (or crown)

McFarland photo

have. Some varieties remain relatively high in price in spite of the fact that they are scarcely show flowers. One of these is Mrs. R. O. Backhouse; it is almost a giant Trumpet, but really a giant Leedsii variety; hence it must be exhibited in the latter class (4a); and although its coloring is beautiful, its other qualities are such that it is scarcely a serious competitor of such varieties as Daisy Schaeffer, Mitylene, and Tunis.

Qualities for Exhibition

What characteristics, then, must a daffodil possess in order to be classed as an exhibition variety?

Form is generally agreed upon as first, by all authorities and judges. Good form depends to a great extent on the perianth, which must be as flat as possible, with the individual segments broad and overlapping. This overlapping of segments varies with the type. Poeticus varieties and some of the smaller-crown Barri and Leedsii varieties show the greatest improvement in this respect; in varieties such as Peggy and Elly Ney (Barri), the segments are so broad as to make the tip actually rounded. Flowers in which the segments are narrow (each one standing out by itself), or twisted, will certainly be ignored by most judges. Really flat perianths are most difficult to find in the giant Trumpet class; two good ones are Aerolite and Dawson City, although neither one is an extremely large flower.

Trumpet narcissus Aerolite with good proportion between perianth and crown

McFarland photo

Proportion. The next point is the size of the trumpet, cup, or crown in proportion to the perianth. There are no hard-and-fast rules regarding this feature; the exhibitor should have an inherent sense of proportion. There are varieties, for instance, in which the trumpet is entirely too large for the perianth, a condition which should readily be apparent to most people.

Posture is another factor; this means the angle at which the flower is supported by the stem. The ideal is a flower held at slightly more than a right angle to the stem, so that it faces a little upward, and is easily seen on the show bench or in the garden. Varieties with flowers facing downward, or extending almost straight up from the stem, lose much in attractiveness. Those having short necks rate ahead of those with necks which are obviously too long.

Substance and **color** are two other points which a good show flower must have. Substance means strength of stems and thickness of tissues in the flower. The trumpet or cup should be firm, and the perianth segments leathery, not thin and tending to transparency. Color is becoming increasingly more important in daffodils, because of the great strides made in this feature in the past few decades. Since many varieties of Incomparabilis and Barri show the most striking combinations of white to rich yellow with palest orange to deep scarlet, it is easy to see the improvement in this respect. With two flowers, therefore, having essentially the same form and substance, color becomes an important factor and will definitely decide the issue.

Size is last, but perhaps not least. All other factors being equal, the largest flower will win; but size alone is not enough. While a huge flower unquestionably influences many judges and the public in general, it must at least have other good points sufficient to overcome the perfection of a smaller flower. Fortunately, the matter of size is not tremendously important: because of the classification of daffodils, there cannot be too much variation. If the blossom selected for a show is typical of its class, it is usually large enough to compete, if it is good otherwise. This is not always true in the case of the doubles and the jonquils, where a great variation in size does exist. Where a class calls for two or more varieties, the more nearly equal these are in size, the better is their chance of winning.

Condition. It is very important to realize that no flower (no matter how good it is potentially) can be considered any better than it is when seen by the judges. Obviously, in order to compete, all blossoms must be in as nearly perfect condition as possible at the time of the exhibition.

Proper Classification. Up-to-date information and classified lists of all varieties may be obtained through the larger State Horticultural Societies. The matter of classification is important, because flowers placed in the wrong class are automatically disqualified.

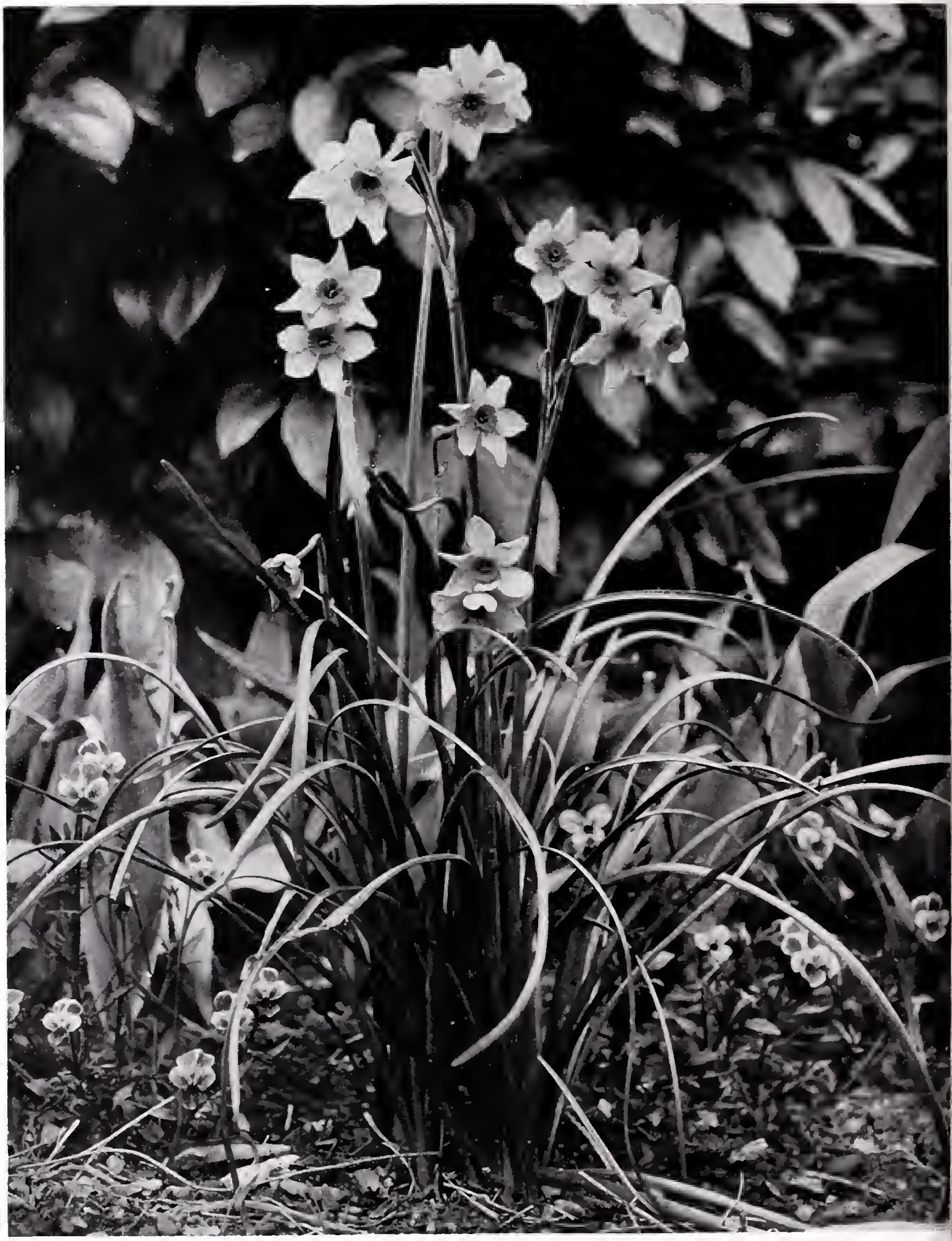
Selection of Varieties

Since importation of bulbs is now allowed, and the supply is plentiful, the level of the average daffodil exhibition should be much higher in the near future. So many improved varieties are available that it is necessary only to have the catalog of a reputable dealer and to select almost any variety with a promising description, particularly if it is recommended for show. The future for the daffodil enthusiast is indeed bright; and there is no reason why anyone interested in exhibiting this truly beautiful flower should not now find at hand the finest kind of material.

BROAD-LEAVED WEEDS KILLED BY 2-4-D

The 2-4-D hormone weed killer (2-4-dichlorophenoxyacetic acid), used so successfully on lawns for the selective killing of dandelion, plantain, and other serious lawn weeds (without harming the grass), now has many promising uses to control and eventually eliminate broad-leaved weeds and woody plants from ditch banks, fence rows, stony areas, rights of way, and other areas where it is not practical to plant or to cultivate; and to prevent seed production of some annual and perennial weeds either on land not in cultivation or among crops which are tolerant of 2-4-D.

This weed killer is available under many trade names, a few of which follow: Dandy-kill, Karmex, Root-an-all, Scott's 4X Weed Control, Tufor, 2-4 Dow Weed Killer, Weedicide, Weedone. Read and follow the manufacturer's directions!



McFarland photo

Narcissus gracilis

FORGOTTEN DAFFODILS

Charming ancestors of the modern hybrids; difficult to obtain, easy to grow

William C. Brumbach

TODAY, when so much fuss is made over our modern hybrid daffodils, it is well to pause briefly and look backward at some of the early daffodils found in gardens as long ago as a century or two. Our modern hybridizers could have accomplished nothing without the old favorites of long ago, because these represent fundamental species or subspecies in a form resembling their wild state. The fact that some of these antiques of the daffodil world have come down to us at least approximately in their original form is proof enough that they are stable types not likely to deteriorate after a considerable number of years in the garden. Let us consider some of these early daffodils in their proper groups as outlined by the Royal Horticultural Society (Great Britain) in 1908.

Yellow Trumpets

In the all-yellow trumpet class is the small, early yellow one found throughout the South in a semiwild condition and called "early Virginia daffodil," or "wild daffodil," according to local custom. This is usually the first of its class to bloom, and it is certainly a direct descendant of the wild daffodils of English pastures. One Virginia grower who handles these says it has been naturalized in Virginia for over two centuries. Compared with our modern giants in this class it is puny; but it has the advantage of being sure to bloom, and it will persist long after some of our modern types have died out. It is excellent for naturalizing.

A similar member of this class, more difficult to acquire, is the Tenby daffodil (*Narcissus obvallaris*), which is said to do well in grassy situations when the moisture is adequate. It is probably merely a variant of the "early Virginia daffodil."

For the rock garden several miniature yellow trumpets are obtainable if one is on the alert for them. They are *Narcissus minor, nanus*, and *minimus* (all forms of *Narcissus Pseudo-Narcissus*) which range downward in size in the order named. With good drainage they will grow among rocks without any attention whatever.

White Trumpets

In the white trumpet class are some of the most interesting and quietly beautiful of daffodils. None of them can compare

The true *Narcissus Jonquilla*

McFarland phot

with the modern Beersheba; but when charm and daintiness are considered, they have indeed a fine appeal. All of these white trumpets are apparently descendants of *Narcissus moschatus,* a little wild daffodil of the mountain meadows of the Pyrenees.

The first one I ever saw was in a garden in Raleigh, North Carolina. The owner had obtained it from a country garden where it had grown ever since anybody could remember, under the name of "Silver Bells." In parts of North Carolina it is said to grow in drifts about old plantation houses, where other garden plants have suffered from neglect—thus showing its permanence.

Recently I have obtained four lots of old white trumpets from a collector in Shreveport, Louisiana. Two of the lots came from the gardens of old Louisiana plantations, the other two from Tennessee and South Carolina. Locally, they are known as "Silver Trumpets," "Silver Bells," or "Nodding White Trumpets," the last name very apt because the flower never becomes quite horizontal even when fully open. I have been pleasantly surprised to find the Silver Bells growing in Williamsburg, Virginia, in some of the old gardens which have not been changed by the restoration. They give these gardens an air of maturity obtainable only with a fine antique.

From a Maryland grower I obtained, last fall, two other old white trumpets, namely William Goldring and the small twisted "swans-neck daffodil" (*Narcissus tortuosus*). I am hoping that these two will find my garden congenial.

Jonquils and Poets Narcissus

In the fascinating jonquil group, probably the most charming and dainty of the lot is the true single jonquil (*Narcissus Jonquilla*). This is not easy to obtain; and most growers erroneously sell the coarser Campernelle jonquil (*Narcissus odorus*) as a substitute for it. The true single jonquil is much daintier, and has a richer, deeper yellow color than the Campernelle. It was a favorite in colonial gardens, and seems to be coming back in those gardens whose owners do not insist on the bolder and larger type of daffodils.

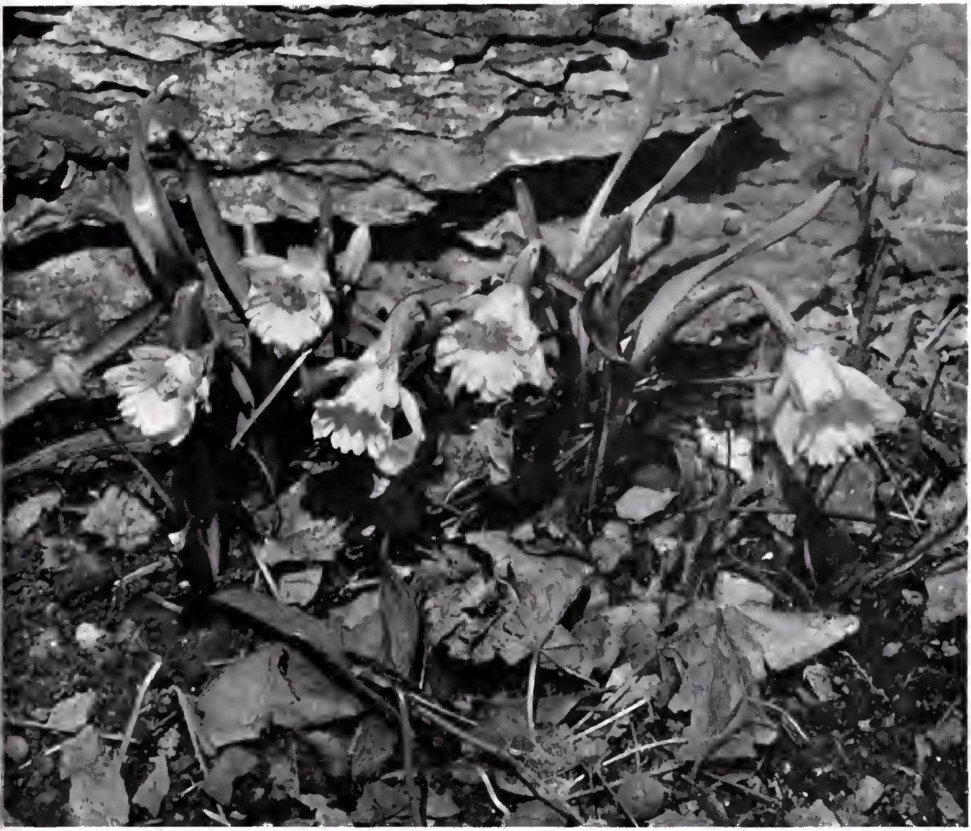
Equally difficult to obtain, but grown to some extent in Holland, are *Narcissus gracilis* and the silver jonquil (*Narcissus gracilis* var. *tenuior*). *Narcissus gracilis* has three or four small sulphur-yellow flowers in a cluster, and blooms very late. The silver jonquil is similar in form but paler, sometimes almost white (hence the name). I managed to obtain bulbs of these two from a Holland grower and also from the Scott Foundation at Swarthmore, Pa. They are indeed charming.

In the poets narcissus group are the old late-blooming Pheasant's Eye (*Narcissus poeticus* var. *recurvus*), and the earlier-blooming *Narcissus poeticus* var. *ornatus.* These were once very popular, and are still used for naturalizing, as they thrive under neglect.

Cluster Daffodils

In the cluster-flowered group are found many old daffodils which were common in colonial gardens. In Raleigh, North Carolina, I learned to know one of the most fascinating of the early cluster types, namely Grand Monarque, which blooms in late winter there. The flowers are small and creamy white with golden-orange cups, and have a fragrance that reminds one of things past.

In Beaufort, South Carolina I observed that even the humblest gardens about the town and in the surrounding country were full of two cluster-flowered narcissi, one white and the other pale yellow. No one knew the name of them, locally, and everyone seemed to think that they had always grown there. They were probably brought from Europe by early settlers. They are completely at home in the sandy soil near the South Carolina coast. Perhaps I shall some day find a satisfactory name for them. In the meantime I have brought back



McFarland photo

Narcissus minimus

several boxes of the bulbs to try in my garden.

On a back road in the beautiful Oley Valley of Berks County, Pa., I found an old country garden literally overrun by a pretty cluster-flowered narcissus. I learned that the bulbs were originally obtained from another farmer who had got them from still another. In this way some of the old types have been perpetuated. Inquiry failed to establish the identity of this narcissus; but I have since satisfied myself that it was Elvira, which has large flowers, for a cluster type, but few in number. It is beautiful, and it increases well. The modern Cheerfulness is the double form of Elvira, but it lacks the charm of the latter.

To me the most interesting and fascinating of the old cluster varieties is Primrose Peerless, or "Twin Sisters" (*Narcissus biflorus*), so called because there are always two flowers in a cluster. It has a pallor and fragrance all its own, and the lemon-yellow cups on a pale primrose background are a relief from some of the modern creations in this group. My stock of "Twin Sisters" was obtained by mistake from a Virginia grower who advertised "poets." I was indeed surprised to find that the cups were not scarlet-margined as in all poets narcissi, and that the stalks were two-flowered, which is only rarely the case in a true "poet." Careful checking established beyond any doubt that these plants were the "Twin Sisters." Besides being easy to grow and quietly attractive, they are valuable for blooming late, coming the first or second week in May and lasting about two weeks. They also increase well, and should be better known.

Double Daffodils

Of the double varieties, there are four worthy of mention here, because they have been grown in this country for generations. Everyone knows the half-wild double yellow trumpet sometimes called Van Sion (or von Sion); it is rather unattractive because it has a lot of green interspersed with the yellow, giving it a dull mottled appearance. It is occasionally seen in old gardens, and bulbs of this type are sometimes included in naturalizing mixtures. The old Queen Annes jonquil is double; it is sometimes found in catalogs, but it has lost favor in the last few decades because it is a shy-blooming type.

Every spring, on the local market stands, I see two other doubles which have grown here in Berks County ever since anyone can remember. One of these is the gardenia-flowered daffodil (*Narcissus poeticus flore-pleno*); it is very beautiful; but it is notoriously hard to grow because it blooms so late in the season that often its buds are dried up by over-warm spring weather and do not open at all. In seasons when there is plenty of moisture and not an excess of heat, the flowers open more reliably. At such times it is a pleasure to point out this aristocratic flower to visitors, because it really looks like a small gardenia.

The other double seen on the market stands is Sulphur Phoenix, locally called "Codlins & Cream," or "Bacon & Eggs"; although these are rather fanciful names, they express very well the variegated appearance of the flower: yellow freely interspersed with orange.

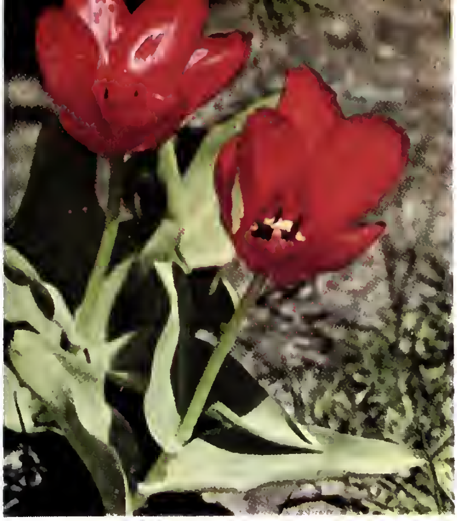
In a country garden where daffodils are grown in strips for market, both of these varieties are scattered among the other types. The owner says they have been growing on the place as long as she can remember, and she has no idea where they came from.

The best daffodils are not necessarily the most expensive. This is easily understood, because the older ones have proved their worth, while many of the new introductions are, at best, precarious in the garden. Whenever any of the good old narcissus varieties can be secured, they should be tried. The romance of past generations which they bring to the garden is well worth the difficulty of obtaining them.

AUTUMN
is the Time to Plant Bulbs

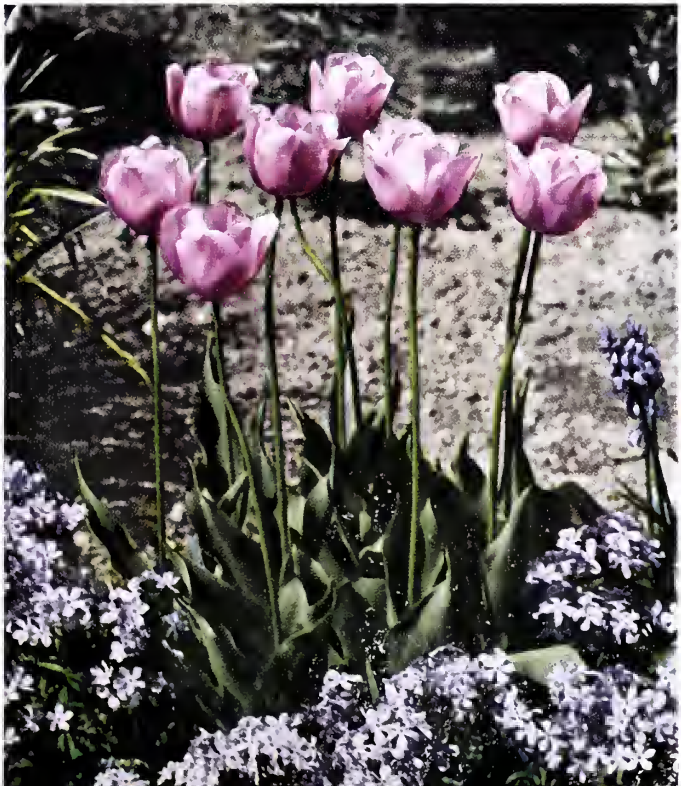
Woodland Border for Early Spring Color

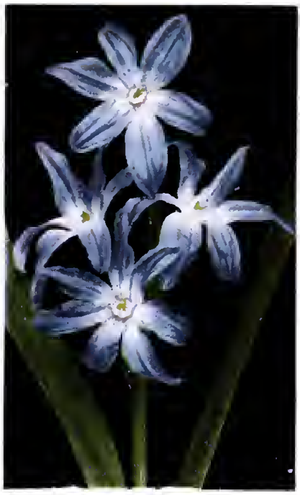
Parrot Tulip "Fantasy"



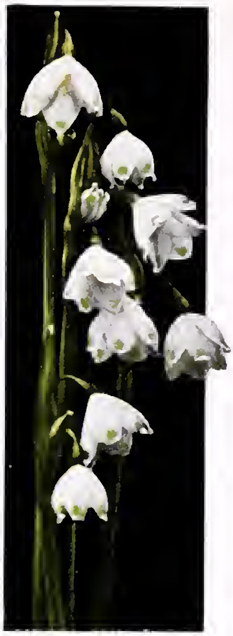
Tulip "Red Emperor" (*Tulipa Fosteriana*)

Darwin Tulip "Muriel" with Blue Phlox (*Phlox divaricata*)



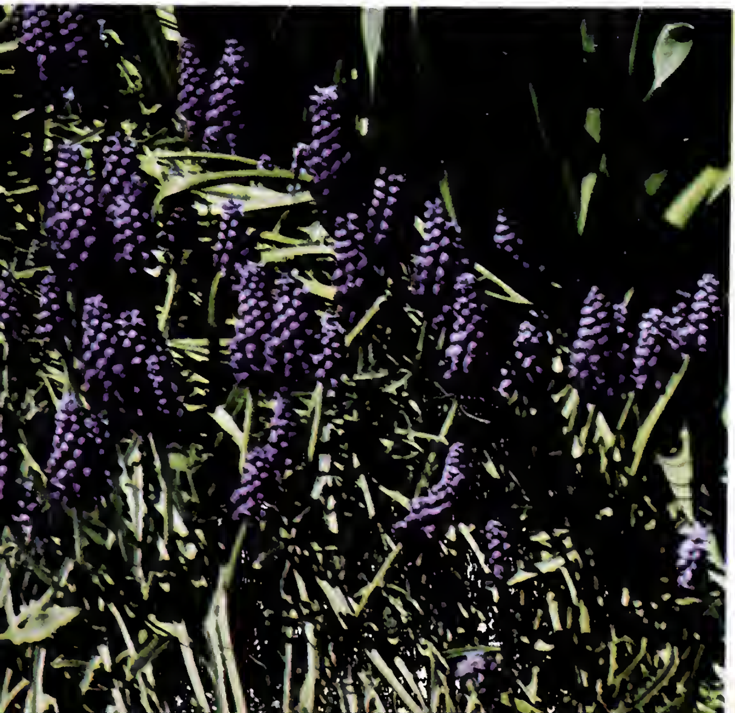


Glory-of-the-snow
(*Chionodoxa Luciliae*)



Snowflake
(*Leucojum aestivum*)

Grape-hyacinth (*Muscari botryoides*)



BULBS BELONG TO . . .

The Lily, Iris, and Amaryllis Families, mainly—although a few are in other families. The genus names listed under the four following families are all mentioned in this issue.

Lily Family (Liliaceae)

Brodiaea
Calochortus
Camassia
Chionodoxa
Colchicum
Convallaria
Fritillaria
Hyacinthus
Lachenalia
Lilium
Muscari
Ornithogalum
Scilla
Tulipa
Veltheimia

Iris Family (Iridaceae)

Babiana
Crocus
Freesia
Iris
Ixia
Sparaxis

Amaryllis Family (Amaryllidaceae)

Galanthus
Hippeastrum
Leucojum
Narcissus
Sprekelia
Sternbergia
Vallota
Zephyranthes

Buttercup Family (Ranunculaceae)

Eranthis

TULIP SPECIES AND VARIETIES

About 100 different species of tulips have been found growing in the wild in southeastern Europe and adjoining Asia. At the present time only about fifteen of these are available from bulb dealers. The others are of little garden value.

Among the larger-flowering tulips there have been thousands of named varieties, but not all of them are in existence now. Bulb specialists' catalogs sometimes list as many as 350 kinds. For the home garden a collection of ten or fifteen varieties of the tall-growing types will give a complete range of color.

NARCISSUS SPECIES AND VARIETIES

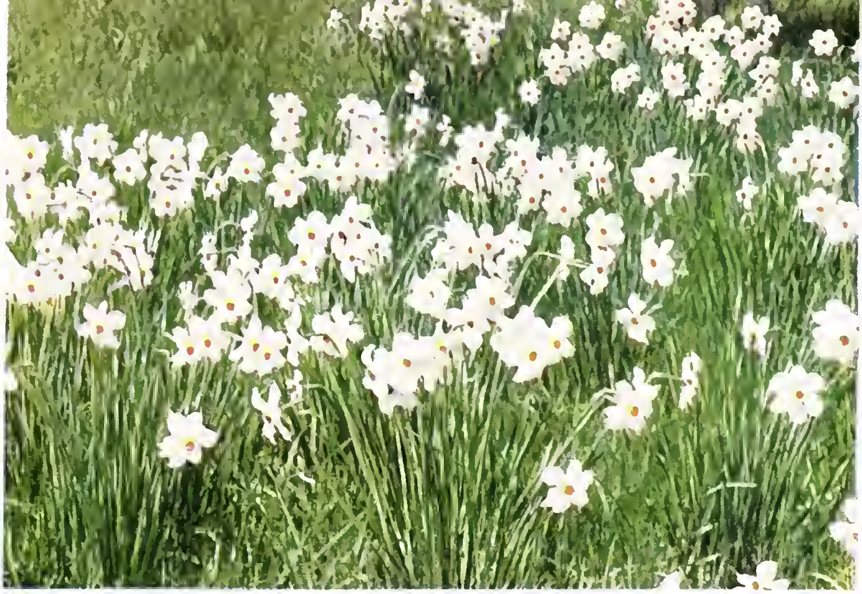
Narcissi are native to eastern Europe, the Mediterranean region, and parts of Asia. There are only twenty-five or thirty true species, but many hybrids are known by Latinized names. These particular hybrids are often referred to as if they were true species (e.g., *Narcissus Leedsii* and *N. Barri*). These hybrids are the parents of many varieties in the trade—the result of years of crossing and recrossing. Of the more than 3000 varieties of narcissus that have been named in the past century or so, only about 125 are now listed as available in this country.

Narcissus juncifolius

Hyacinth "L'Innocence"
(*Hyacinthus orientalis*)

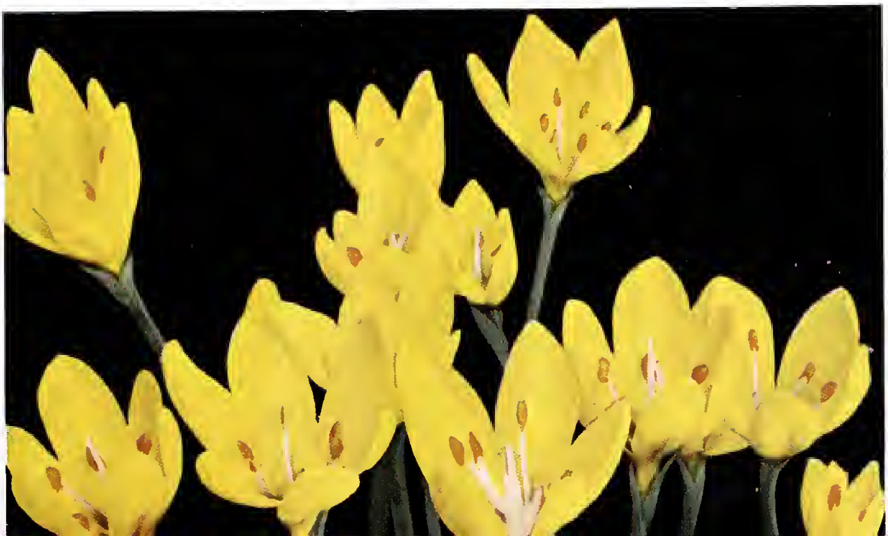
Star-of-Bethlehem (*Ornithogalum umbellatum*)

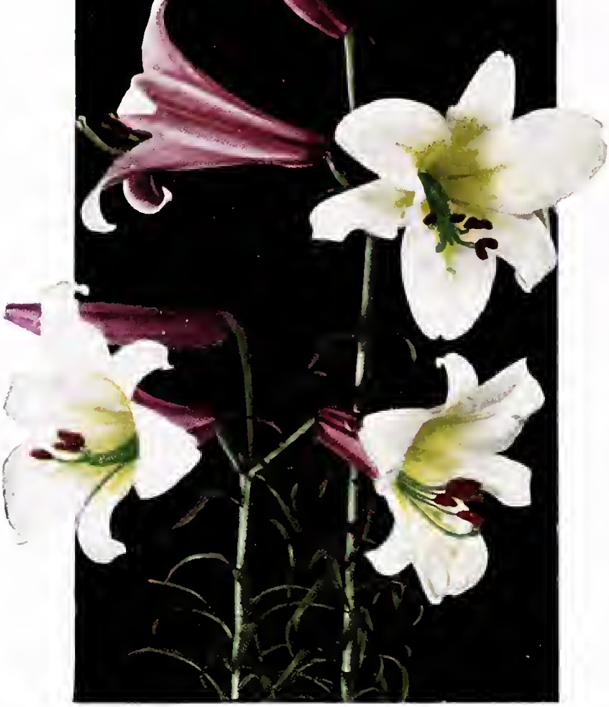
Mariposa-tulip (*Calochortus*), hardy in the East if planted late



Poets Narcissus (*Narcissus poeticus*)

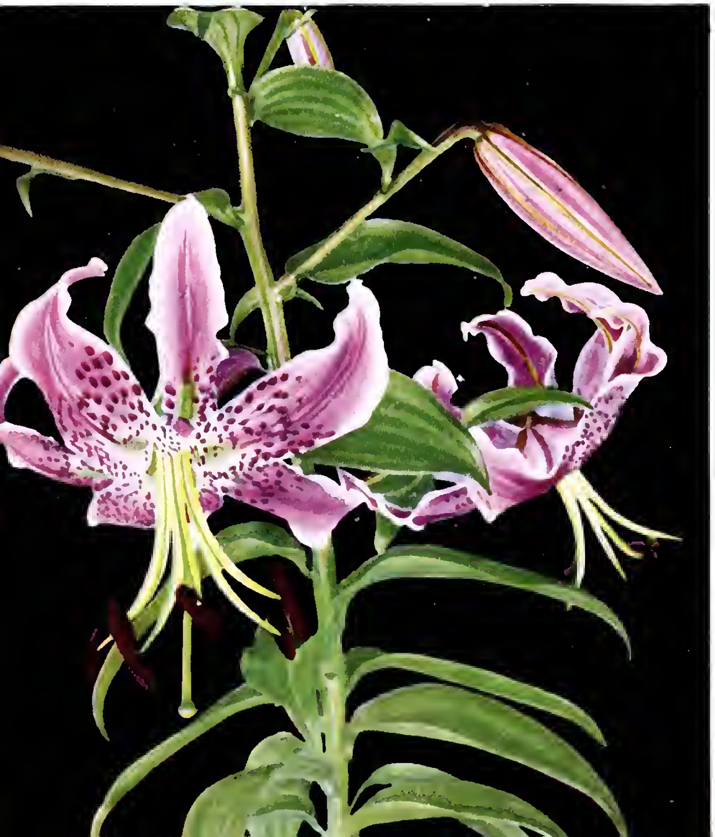
Sternbergia (*Sternbergia lutea* var. *major*)





Regal Lily
(*Lilium regale*)

Showy Japanese Lily (*Lilium speciosum magnificum*)



THE REGAL LILY

Conrad B. Link

THE regal lily (*Lilium regale*) has been one of the most popular of plant introductions of the past fifty years. It was discovered in 1903 by E. H. Wilson in the valley of the Min River in western China, and was brought to the United States in 1908. Its extensive use by gardeners who *plan* their plantings is probably the best evidence of its desirability. If the average gardener is faced with the need of choosing a single lily, this is undoubtedly the one to be chosen. And it is a must in the collection of the lily enthusiast. Probably no lily is more completely reliable under a great variety of growing conditions.

The regal lily is a sturdy, strong-growing plant with a stiff wiry stem. The numerous narrow leaves are usually dark green, although some may show a reddish bronze color near the tip. Unlike the foliage of many lilies, the regal remains green until fall. The plant blooms for two or three weeks in early July, in the New York region; and it is not uncommon for a strong-growing plant to be 4 to 6 feet tall, carrying 20 to 25 flowers.

Culture

The regal lily, like all lilies, requires the well-drained soil necessary for all perennials. Organic matter (leaf mold, peat-moss, or well-decomposed manure) should be added when the soil is being prepared. If possible, this should be incorporated into the soil several months before planting time; but if thoroughly decomposed, it may be put in just before the bulbs are set out. Manure is the most valuable, especially if it has been well cared for so that the nutrients are not leached from it. Fresh manure should never be used at the time of planting, because it may injure the bulbs if it comes in contact with them (this applies to bulbs of all kinds). In preparing the soil, it is wise to add superphosphate at the rate of 5 to 10 pounds per 100 square feet; and if the general fertility of the soil is low, a complete fertilizer should be used (4–12–4 or 5–10–5) at the rate of 3 to 4 pounds per 100 square feet.

Regal lily bulbs should be planted in September or October. The size determines the depth of planting; but commercial-size bulbs are planted 6 to 8 inches deep, or in loose sandy soil as deep as 10 to 12 inches. This deep planting protects the new shoots in the spring by causing a delay in their emergence above ground. Bulbs are less hardy the first year; hence a mulch of coarse material should be used on newly planted bulbs. In succeeding years a mulch may not be essential, but it will give protection from alternate freezing and thawing.

All lilies are subject to insect pests and diseases; but the regal is less susceptible than most lilies, especially to lily mosaic and blight. It is important, however, that disease-free bulbs be purchased; and these are more likely to be obtained from reliable dealers. Since the regal lily is easily propagated by seed, disease-free bulbs may be produced in one's own garden if there are no diseased lilies there. Insects and diseases are kept at a minimum by good cultural practices, as outlined above.

Uses

The flowers of the regal lily are excellent for cutting; but they should be cut so that at least one third to one half of the stem remains on the plant. This is essential for the growth of the bulb. Because the plant is strong and sturdy, it lends itself to many landscape and garden uses. It may be grown with other perennials and is especially effective in clumps as accent points in the perennial border. Clumps of the regal lily in front of red or pink rambler roses are most striking. When they are planted with evergreens or in front of shrub borders, or in the partial shade of large trees, their cool white stands out in contrast with the green, and makes a delightful summer picture.

LILIES FOR EVERY GARDEN

Easily grown varieties, blooming from June to October

Alan Macneil

ALL lilies are better for fall planting, but many species native to Asia will grow if planted in the spring. Spring is always a second best, however. Unlike most bulbous plants, the various kinds of lilies mature at different periods in the season, a few of them as early as August, others as late as the end of October. The addition of imported bulbs further extends an already long planting season, and so it is inevitable that a number of kinds will arrive from the nursery very late. For these the ground can be mulched, so that it will be kept open; the bulbs can be set out as soon as they are received, and the mulch replaced so that the ground will freeze gradually.

The majority of the lily bulbs planted in our gardens are American-grown and adjusted to our climate, and do not have to withstand the rigors of long travel. This is a great advantage, for lily bulbs are more perishable than most kinds of bulbs.

A comprehensive list of lilies is so extensive that selection is sometimes difficult. The following list of recommended lilies is made up of those that should grow well without any particular attention—that is, with no more attention than is given any ordinary perennial. Individual requirements of specific lilies are mentioned. Such requirements can easily be met in most gardens, but it is well for the gardener to know of them in advance. Any lily in this group should be infinitely rewarding for the amateur gardener, with a single exception—*Lilium japonicum*, the one capricious lily mentioned.

Early June

Lilium rubellum. Dwarf; fragrant, pale pink trumpets. Easy, but does better in a heavy soil.

Coral lily (*Lilium pumilum*, or *tenuifolium*). Scarlet, fragrant Turks-caps, showy in a delicate way like scarlet Spanish lace. Grows to 2 feet; easy, but not long-lived.

Lilium Szovitsianum. Pale, straw-yellow, fragrant, bell-shaped. Grows 3 to 4 feet; generally takes a year to flower. Imported bulbs rarely travel well, and are best avoided.

Late June

Madonna lily (*Lilium candidum*). Indispensable; pure white, short trumpets, fragrant. Grows to 5 or sometimes 6 feet.

Meadow lily (*Lilium canadense*). A beautiful native; soft yellow or red, pendent bell-shaped blossoms. Infinitely graceful; 4 to 7 feet, depending on the individual plant and its location in the garden.

Turks-cap lily (*Lilium Martagon* var. *album*). Pure white, small Turks-caps well spaced on a tall stem; fragrant, delicate, and lovely. Does better in clay and a rather sweet soil.

Lilium japonicum. Shell-pink, fragrant trumpets on slender stems about 2 feet tall. Decidedly unreliable, but worth trying. Grows better in an acid soil that is rather moist.

Lilium Hansonii. Golden yellow, small, sharply reflexed blossoms. Grows 2 to 4 feet. Almost indispensable. Grows well practically anywhere, and stands a fair amount of shade.

Lilium Mrs. R. O. Backhouse. Ivory Turks-caps flushed with straw-yellow and mauve; fragrant. Still relatively scarce. One of the most beautiful flowering plants in existence, when well established. Grows to 6 feet.

The Umbellatum lilies. The familiar orange-red type, with its upright, cup-shaped blossoms, is common. Some of the deeper reds, yellows, and glowing apricots are choice, as are several fine new groups of mixed seedlings now on the market. All of these lilies are exceedingly easy to grow, and increase very rapidly.

Early July

Regal lily (*Lilium regale*) and its various hybrids, including the highly mixed Green Mountain hybrids. The great group of July-flowering white trumpet lilies should be planted in every garden in some quantity. They are indescribably beautiful, and invariably grow well. If any conditions particularly favor their growth, these are sun and a moderately heavy soil.

Lilium Brenda Watts. One of the most striking of the recent introductions; a lily that grows magnificently under practically all circumstances. The height, when established, is about 5 feet. The color is brilliant lacquer-red, and the reflexed blossoms are outward-facing.

Lilium Edna Kean. A hybrid of the same origin as the above. It does not grow quite so tall, and its color is deeper—a fine, warm, cherry red.

Lilium Coronation. Another hybrid of the same group, a clear brilliant yellow. The plants grow to 3 feet and are superbly handsome. Good clear yellows in lilies are not too common, and are apt to be difficult. This is one of the best. Commercial propagation of this lily is slow, and so bulbs are still relatively expensive; but they are well worth the cost.

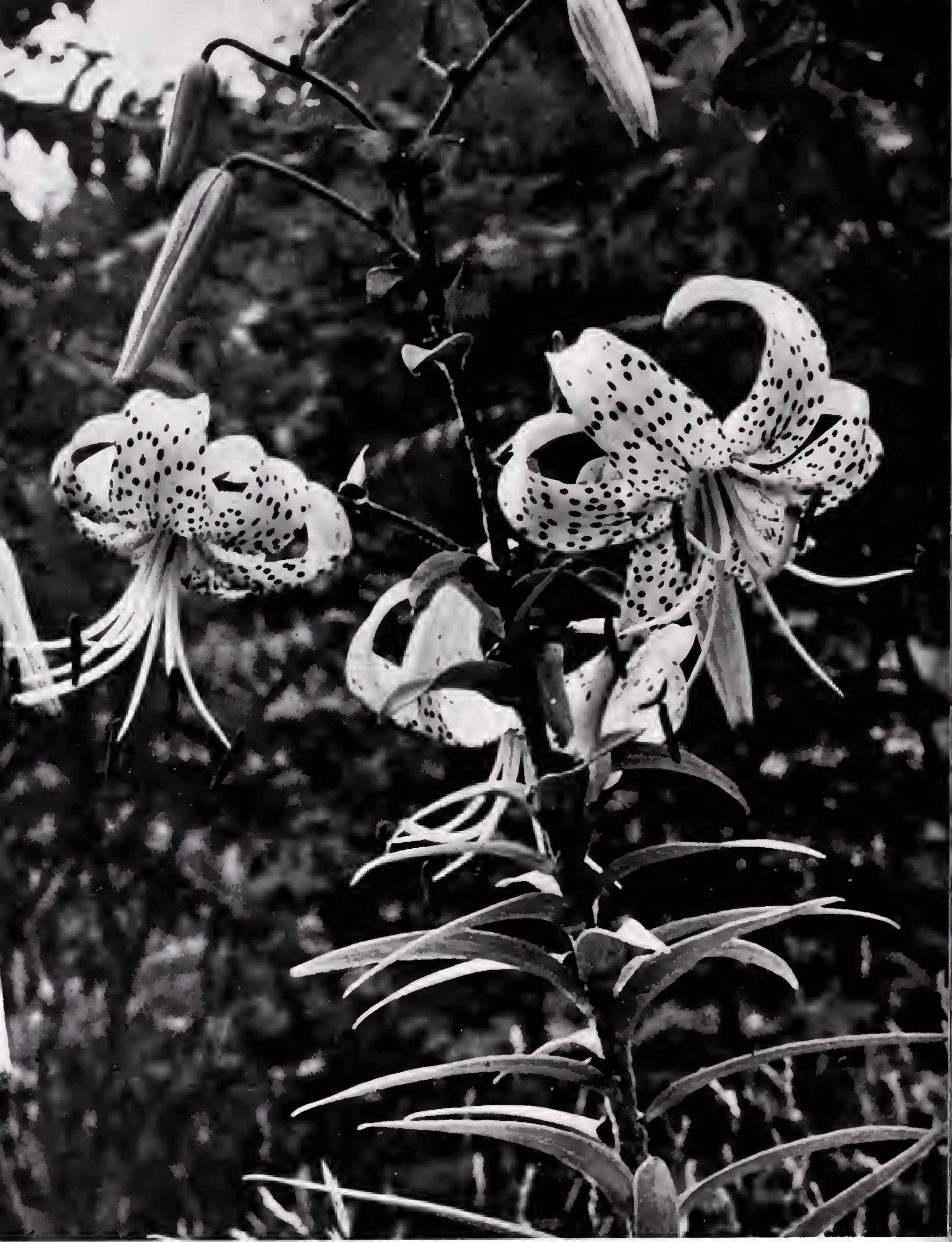
Another variety of candlestick lily (*Lilium dauricum* var. *Wallacei*)

Late July

Candlestick lily (*Lilium dauricum* var. *Wilsonii*). A particular favorite of the author's, with its soft apricot, brown-spotted, cup-shaped blossoms. The color is very nearly unique. The season extends from late July almost through August, and the plant rarely exceeds 15 inches in height.

Lilium Maxwill. A Canadian hybrid, somewhat resembling the tiger lily, but smaller and more graceful and a few weeks earlier. It is very easily grown, and reaches 6 feet in the average garden.

American Turks-cap lily (*Lilium superbum*). One of our finest native plants. The recurved blossoms are soft reddish-orange, brown-spotted, and pend-



Gottscho-Schleisner photo

Tiger lily (*Lilium tigrinum*)

ent; the plants grow from 5 feet up to 10 or 12 feet, depending on location. It grows well practically anywhere, but succeeds in more moisture and shade than do most lilies.

Tiger lily (*Lilium tigrinum*). This is well known with its large, recurved orange-red blossoms. The color is not liked by all gardeners; but the plant is so very handsome when well placed, and invariably grows so well, that it is much more useful than is commonly realized.

Goldband lily (*Lilium auratum* var. *platyphyllum*). A more massive variety that flowers a week to ten days earlier than the type. It is as spectacular in flower, as any plant known; and every gardener desires this as well as the type. All forms of the goldband lily are liable to mosaic infection. They should either be planted away from other lilies, or else be handled as biennials.

Early August

Goldband lily (*Lilium auratum*). This lily is so well known that no more than mention of it is indicated here. As with its variety *platyphyllum*, the plants are easy to grow, and flower for a single season. Success in keeping them is even more unpredictable; and the same precautions regarding mosaic should be observed.

Lilium Henryi. Soft orange-yellow, reflexed blossoms on stems that are apt to need staking. This is a lily that grows easily everywhere. Lime is better for it than for most lilies. When established, it increases rapidly and may reach 8 feet.

T. A. Havemeyer seedlings. One of the finest groups of hybrid lilies in existence: the result of a cross between *Lilium Henryi* and *Lilium myriophyllum* var. *superbum* (or *Lilium sulphureum*). Still scarce, but a must for the August garden. The plants vary in size and shape of the flower, ranging from semi-trumpet shape to large reflexed types. The colors may be persimmon-orange, deep gold, ivory, citron-yellow, white, or any combination of these. In most gardens the plants tend to grow to 4 or 5 feet only; in others, where conditions suit them exactly, they have reached 10 to 12 feet.

McFarland phot

Goldband lily (*Lilium auratum*)

Showy Japanese lily (*Lilium speciosum punctatum*). The early-flowering, graceful form of the showy Japanese lily, a special asset in those northern gardens where the type is apt to flower so late as to be practically useless. The plant grows to 5 or 6 feet; and the fragrant blossoms are paler than in the type, generally white, flushed and spotted with soft rose and pink.

Late August and Early September

Showy Japanese lilies (*Lilium speciosum rubrum* and *Lilium speciosum magnificum*). The more brilliantly colored forms are better known than the pale one mentioned above. They grow well and flower well invariably except in the far North. For succession, both *Lilium speciosum punctatum* and either *rubrum* or *magnificum* should be planted in the same garden.

***Lilium formosanum*, intermediate forms.** The tall, late-flowering fragrant white trumpet lily has been bred in terms of early bloom. It grows to 5 feet. Like the goldband lily, it is subject to mosaic; and similarly, it must either be considered as a biennial or be kept away from other lilies. Aside from this it has no special requirements.

McFarland photo

Lilium formosanum

Lilium Seneca. A recent American hybrid of the tiger lily. The color is softer, the blossoms more outward-facing, and the season several weeks earlier than in most forms of tiger lily. It is a handsome plant, and normally reaches 6 feet. The warm reddish-apricot color is welcome at this time of the year.

September and Later

Goldband lily (*Lilium auratum*), late-flowering forms. These are specially selected for September and October bloom. They are taller than the type, and equally susceptible to mosaic.

Lilium formosanum. A fine late-flowering white trumpet lily that is generally in good form well into October. Plants grow to 6 and occasionally to 7 feet. They are susceptible to mosaic, but that is the only disadvantage.

Showy Japanese lily (*Lilium speciosum album*). The pure white form flowers several weeks later than the colored forms. It is one of our most beautiful lilies; but the lateness of season limits its usefulness for gardens in the far North. We hear rumors of a recently discovered variety that flowers from three to four weeks earlier. If the rumors are based on fact, this new lily will be an infinitely valuable addition to our gardens. There are several white forms of the showy Japanese lily in commerce; both *Lilium speciosum album* and *Lilium speciosum Kraetzeri* are very fine, but the best of them all is the still rare form known as *Lilium speciosum album-novum*. One of the features that distinguishes this rare lily is its pure yellow pollen in place of the usual brown or copper-brown pollen.

BRODIAEA

Little known, but well worth cultivating

Elmer C. Purdy

THE lily family provides most of our bulbous flowers. All are lovely. They vary in color, form, and size, from the tiny-flowered *Tofieldia* and *Allium* to the large and showy tulips and lilies. But no member of the family presents a wider variety of height, color, form, and habit, or is more graceful and lovely than *Brodiaea.*

Brodiaeas are perhaps less known and less planted than any other bulbous flowers; yet their gracefulness and beauty, their variety of form and color, their lasting qualities both in the garden and in the vase, their adaptability to a wide range of situations and of soils (even poorest soils)—all of these qualities particularly commend them.

In all kinds the grass-like leaves grow at the base of the plant; while the slender, wiry flowering stem is naked, and stands erect, crowned by a cluster of star-like flowers. The height varies from 3 inches, in one kind, to 36, or occasionally 48 inches in another. There are several forms of flower clusters. In one the individual flowers are very short-stalked and densely crowded into a many-flowered head. In another, the many flowers have stalks 1 to 2 inches long, forming a loose globular head 3 to 4 inches broad. In still another, the stalks of the flowers (five to fifty in number) are 3 to 5 or even 8 inches long, loosely arranged in a spreading cluster 6 to 15 inches broad. In one unique species, the floral fire-cracker (*Brodiaea coccinea,* sometimes called *Brevoortia Ida-Maia*), the crimson flowers resemble a bunch of the old-fashioned fused Chinese fire-crackers. The snake-lily (*Brodiaea volubilis*) is climbing and twining, and has been known to have a stem 36 feet long. One odd species has flower stalks radiating from an underground stem. Colors vary from white, pink, rose, red, and yellow, through all the shades of blue from soft lilac-blue to deep purple.

In nature, brodiaeas are found in two predominate groups: one in full sun in fields and on slopes, the other in woodlands in light to moderate shade. Neither holds strictly to these lines: the woodland kinds do well in the full sun, while the "Harvest" or typical sun types are often found in light shade.

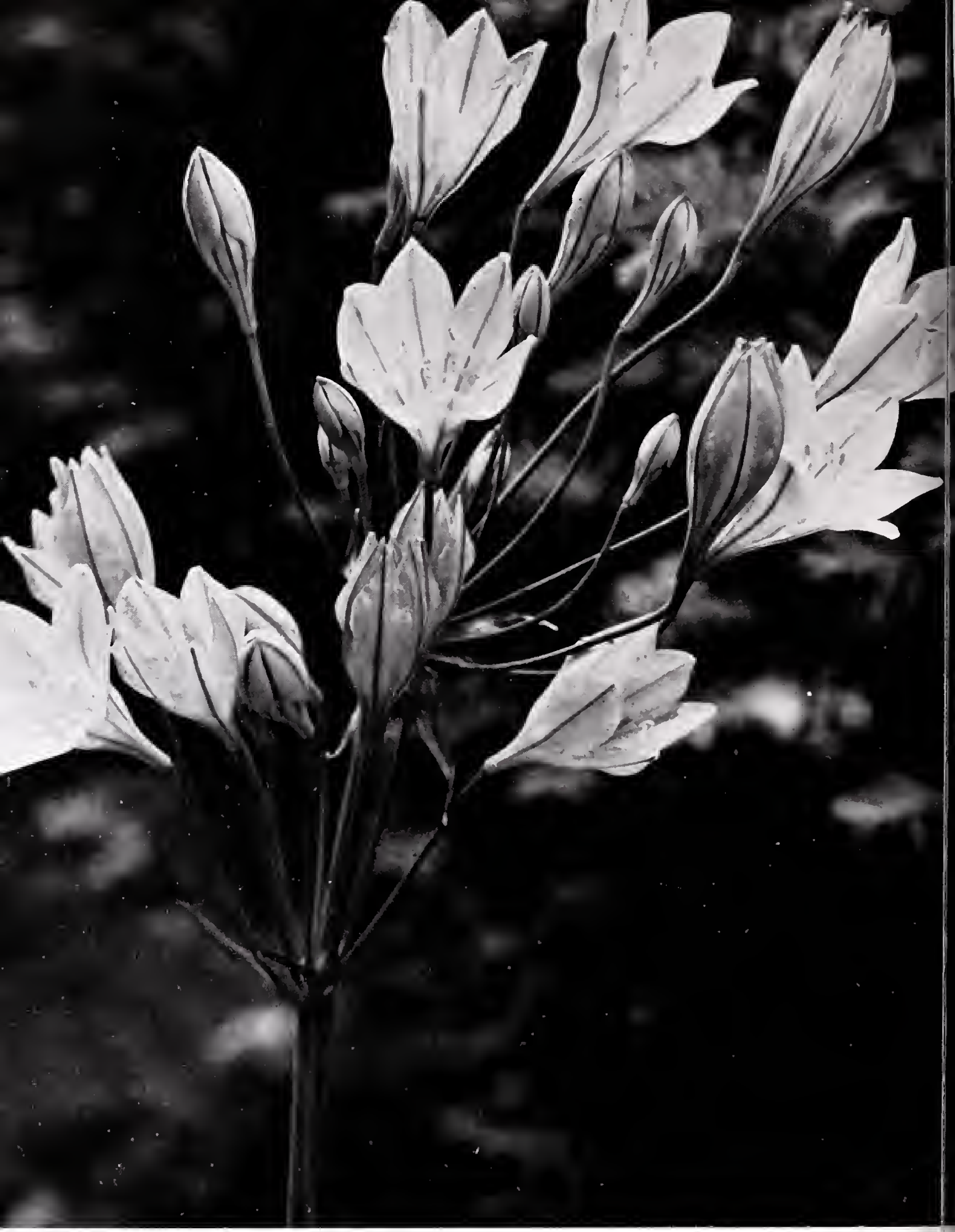
Culture

Their one strict requirement is well-drained soil. If the soil is well drained, it may be heavy adobe or clay, or thin gritty or sandy soil, and with or without humus. Moisture should be plentiful during the growing and flowering seasons. After flowering, the plants may be completely dried off.

The summers are entirely rainless on the west coast of the United States, where brodiaeas are native. Hence, the longevity of these plants will be greater if the beds in which they are planted are dry in the summer, or if the bulbs are dug up and stored dry for replanting in late October. However, we find brodiaeas more tolerant of summer moisture than other bulbs of this region. Bulbs planted ten years ago in our rock garden, which is pretty heavily watered all summer, have flowered year after year. Several eastern gardeners report similar experience.

When bulbs are planted, they may be spaced 2 to 4 inches apart, and covered 2 to 3 inches over the tip of the bulb—3 inches in light soils.

Bulbs ordered from dealers will be received after September 15. In southern and western States, they may be planted at once. Bulbs are packed dry, and re-



McFarland phot

Brodiaea laxa

tain full vitality up to November 15 even if they are not planted. In the event of early rains and a warm autumn, bulbs planted early may start growing prematurely. In all cold regions, planting should be deferred until some time between late October and November 15. Nature takes care of her own; and late-planted bulbs will start root growth in the spring just as the local native bulbs do. No mulch is necessary. If a mulch is used, it must be removed promptly in very early spring, because the tender shoots cannot push through it.

Flowering time in the open varies from March 15 to mid-July, according to the species and the climate in which they are planted.

Brodiaeas may be planted with other bulbs on open slopes or in any odd corner. Dotted in the rock garden either under stones or among late-flowering plants, they are particularly effective.

They are excellent pot subjects in ordinary garden soil. If rich potting soil is used, the bulbs should be surrounded with sand. Pots may be sunk into the garden or placed in cold frames for earlier flowering. If they are potted early and set aside for six weeks to root thoroughly, they may be taken into the greenhouse at 55° to 60° F.; but they tolerate no bottom heat.

Outstanding Varieties

There are some thirty species and a number of varieties and intermediates. I shall mention only a few of the outstanding ones that are likely to be found in catalogues. The so-called wild hyacinth (*Brodiaea lactea*) is 6 to 12 inches tall, milky white with a green mid-vein. The floral fire-cracker (*Brodiaea coccinea*), with rich crimson color, is 24 to 36 inches. The "Twining Brodiaea," or snake-lily (*Brodiaea volubilis*), has close heads of rose pink. The grass-nut, or triplet-lily (*Brodiaea laxa*), is 12 to 30 inches, and has a spreading cluster of as many as fifty flowers. *Brodiaea Bridgesii*, 15 to 24 inches, has a broad cluster of many reddish-violet flowers. *Brodiaea crocea*, 8 inches, has golden-yellow flowers in a globular cluster. Blue-dicks (*Brodiaea capitata*) has one to several 8- to 18-inch stems from each bulb, and heads of deep blue. Except the last, which is equally distributed in the woods and in the open, all of the foregoing are woodland species.

The following "Harvest" brodiaeas are more usually found in full sun. They have 8- to 20-inch stems and from five to twelve upward-facing flowers. *Brodiaea californica* (July) is in two color forms: deep blue tinted lilac, and soft lilac-pink. *Brodiaea coronaria* (or *grandiflora*) blooms in June and has very lasting flowers of glossy deep blue. *Brodiaea Eastwoodii* (June–July) has dense heads of milky white flowers, veined lilac; it naturalizes readily in heavy moist lands.

If directions are carefully followed, these plants will grow and flower well in most parts of our great country.

ASH RUST

This is the "ash rust year" in certain parts of New England, according to Dr. James G. Horsfall of the Connecticut Agricultural Experiment Station. Ash rust is caused by a fungus (*Puccinia fraxinata*) which spends part of its life cycle on the ash and part on the marsh grass. Generally it seems to be worst along the ocean shore. Dr. Horsfall regards ash rust as a sporadic disease, and considers that its presence is not cause for undue alarm.

COLCHICUMS

Neglected autumn treasures

A. P. Saunders

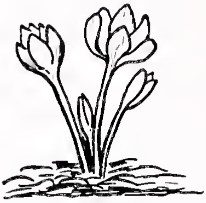
THE autumn-crocuses *(Colchicum)* are so easy of culture and so conspicuously beautiful that one can only marvel that they are so little grown by garden enthusiasts. There are two groups of these plants: the natural species and the hybrids. The species are native to southern and eastern Europe and near-by regions.

Species

One of the finest of the species is *Colchicum Bornmuelleri.* Its flowers come early (in late August or September), and are very large for colchicums, as large as small tulips. Their color is a somewhat mauvish pink; this sounds like a doubtfully attractive color, but it is beautiful and is typical of the colchicums. They have a narrow range of color, and all except the white ones are pink with a mauve cast.

Soon after *Colchicum Bornmuelleri* has flowered, the varieties of *Colchicum speciosum* vie with each other for the position of favorite. The type *(Colchicum speciosum)* has an impressive blossom of beautiful mauve-pink. It multiplies very well and is a source of pleasure until mid-October. But the loveliest of this group is, to my mind, the white one *(Colchicum speciosum* var. *album)*, an ivory-white blossom of large size and great beauty. Unfortunately, it is not good at multiplication, at least under the growing conditions in my garden. I planted ten bulbs some fifteen or twenty years ago, and now have six or eight.

Colchicum in spring



Colchicum in autumn

For variety of interest, it is worth while to have one of the dwarf forms. *Colchicum agrippinum* is a low-growing plant, with flowers almost on the ground. It is very pretty and well worth having, though not one of the compelling forms. The common autumn-crocus (*Colchicum autumnale*) is also a pretty plant, but not worthy of being named in company with the finer kinds.

Hybrids

In recent years the hybrid forms have transformed colchicum culture. These have been put on the market by C. G. van Tubergen of Haarlem, Holland; but I understand that they were originated mostly by G. C. van Meeuwen & Sons of Heemstede. Whoever first saw them, saw something out of the ordinary; for these hybrid forms are as good as the finest species, and quite different.

The hybrids one should try are the following, at the least: Lilac Wonder and The Giant, both very fine and blooming profusely when established; also one of the deeper-colored forms, Autumn Queen or Princess Astrid. In these the color is distributed in tiny squares, alternately light and dark.

Peculiarities

Cautions. The leaves of colchicums are poisonous, containing the active and dangerous chemical, colchicine; therefore they should not be grown where cattle may eat them. They are not poisonous to touch, however. The leaves are large and vigorous through the spring, but they dry up and turn brown in early summer. Hence, if colchicums are grown alone, the bed is untidy-looking or bare from late June or early July until flowering time.

In September or October the handsome flowers come up out of the ground with no leaves accompanying them. The seeds are formed under the ground, and are sent up and scattered on the surface the following summer.

Colchicum blossoms may sometimes be picked with long stems; for the top of the bulb is set 2 to 3 inches below the surface of the soil (when properly planted), and the flower springs from the bottom of the bulb. Since the stem of the flower may be 6 to 8 inches long above ground, it is not unusual (if it be carefully pulled up) to have a stem a foot or so in length.

A good many dealers in America now carry colchicums in variety; and a dozen or two dozen bulbs of the varieties I have recommended will add treasures to any garden. These plants are precious because they come into bloom when most flowers are through. The sight of a large group of them is something never to be forgotten. They should be given a place by themselves, free from the rivalry of stronger-growing plants. And the grower, standing over them in October, should have nothing else in sight to distract his mind from their quiet loveliness.

Common autumn-crocus (*Colchicum autumnale*)

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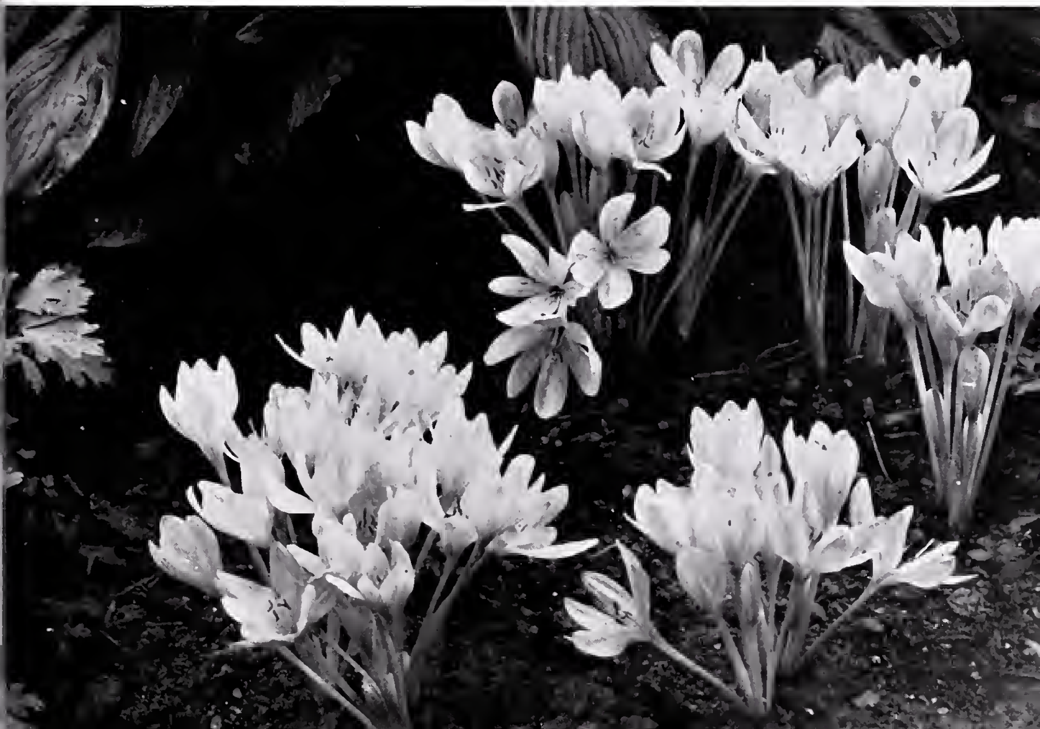


TENDER BULBS FOR THE HOUSE

Good ones to select, and how to treat them

Silvia Hathaway Evans

TENDER bulbs bring winter bloom into the house, along with a certain amount of trouble; but with individual attention and patient care, they well reward those who like to grow their own at any cost.

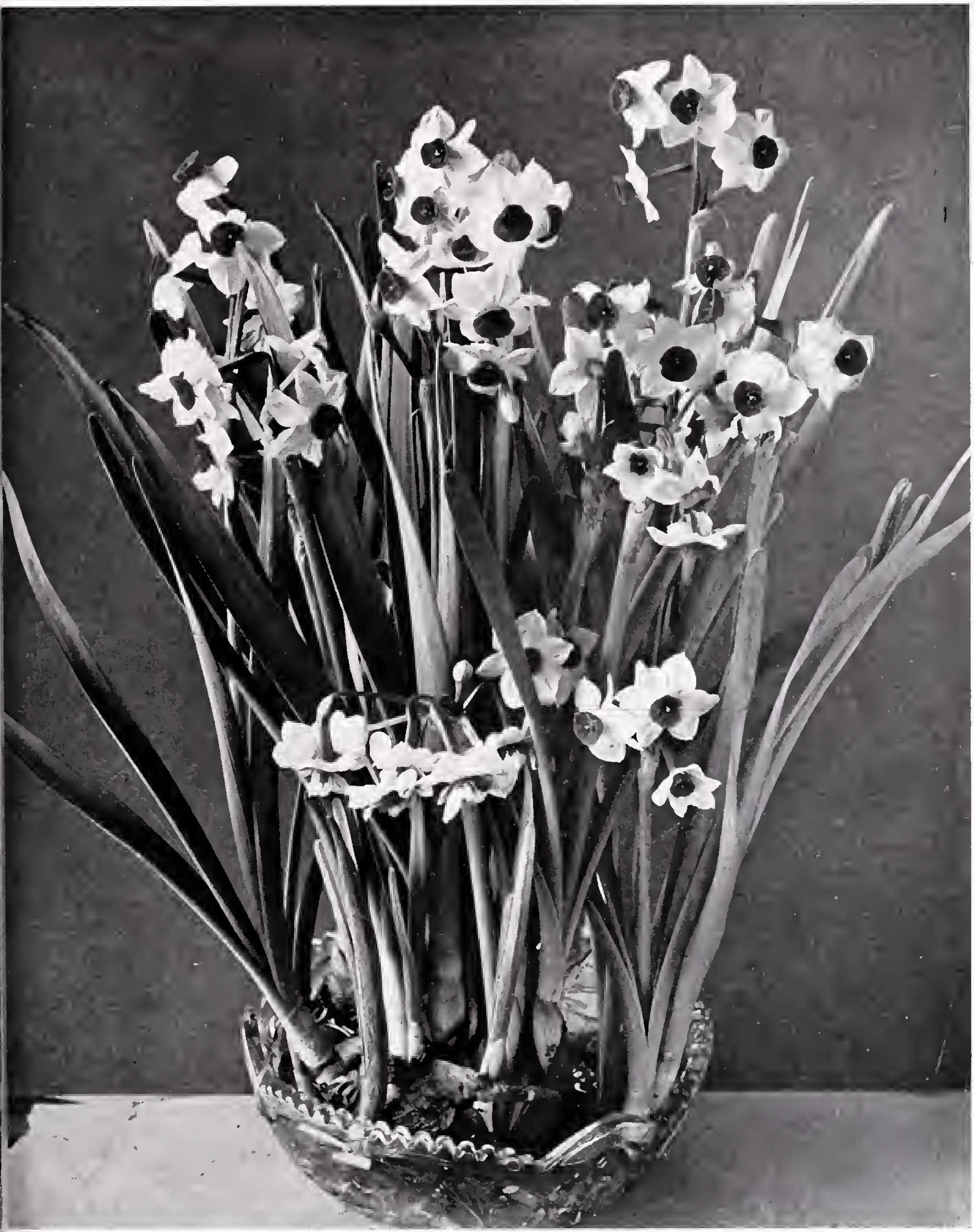
Tender bulbs, as distinct from hardy bulbs, are those that must not be frozen. Such bulbs should be planted in rich soil, and brought to maturity slowly. They should be started in partial shade with a moderate amount of water, and grown cool from beginning to end. A temperature of 60°F. is much more congenial to them than the humanly preferred 70°. With patient growing (not forcing too fast), and with periodic repotting in new soil, most of these bulbs may be used year after year. There are various groups of tender bulbs, suitable and wholly satisfactory for ordinary home use, which respond to slightly different methods of treatment.

Easier Group

Probably the easiest winter house bulbs, and the most completely foolproof are those of the paper-white narcissus (pure white form of *Narcissus Tazetta*), and the yellow variety, Grand Soleil d'Or, and the Chinese sacred-lily (*Narcissus Tazetta* var. *orientalis*). These may be grown in fiber or in pebbles, with about three quarters of the bulb above the surface. They should be planted about the middle of October or later. Until a strong root system develops and top growth starts (usually two or three weeks), the pans or bowls of bulbs should be kept in a cool, dark place. Successive plantings about two weeks apart can keep these flowers in bloom in the house from Thanksgiving until March. Bulbs planted after December 1 will make sturdier, quicker growth, and will be more satisfactory than those planted early. These bulbs will not force a second time.

Two other kinds, dependable and easy of culture, are the cape-cowslip (*Lachenalia*) and *Veltheimia*—both from South Africa. Cape-cowslip bulbs may be potted in soil (equal parts of sand, leaf mold, and good garden soil, with a tablespoon of bone meal for a 4-inch pot) in September or October, and kept in cool and shady surroundings until November. (A shaded cold frame or protected outdoor situation is very good if an alert weather eye is kept for freezing conditions.) The bulbs may then be brought into full sunlight, and will usually be in bloom by Christmas. If the plants are kept cool and well watered, the flowers will last for several weeks. The bulbs of cape-cowslip are small, and may be planted three or five in 4- or 6-inch pots respectively, with the tips of the bulbs just covered. If watering is slowly decreased after flowering, and the leaves are allowed to dry gradually, the bulbs may be stored and used again. Our most satisfactory results have been with *Lachenalia pendula* var. *superba,* whose bright, curiously shaped flowers remind one of green-tipped fire-crackers. *Lachenalia tricolor aurea* is also good, but less interesting and less gay in color.

Veltheimia viridifolia has a large bulb, which should be planted alone in a 6-inch pot, the bulb half-covered by soil. Planted in September, and grown like the cape-cowslip, it produces a rosette of vigorous, broad, shiny, very bright green, strap-like leaves; it is a lovely and decorative foliage plant during the winter, though it does not send up its



McFarland photo

Narcissus Tazetta

single flower stalk until January. This stalk rises high and bears a long cluster of small rose-pink flowers, tinted variously with yellow, salmon, red, and green. It is a really repaying plant, and well worth trying. These bulbs may be ripened off (after the flower stalk is faded and cut) like those of the cape-cowslip, stored in their pots during the summer, and repotted in the fall.

Another tender bulb, easy to handle and popular for winter bloom in the house, is Hippeastrum, commonly known as "amaryllis," and closely related to the true Amaryllis, or belladonna-lily. The bulb produces strikingly gorgeous lily-like flowers of varied and vivid colors, from white to blood red, intense crimson and orange, and all sorts of striking combinations of bright colors. The bulbs may be potted any time after October, singly, in pots very little larger in diameter than the bulbs themselves. They bloom better if they are somewhat pot-bound; and smaller flowers are usually the result of letting the bulbs spend their energy in filling unnecessarily large pots with roots. They are greedy feeders; and so the soil should have a little more well-rotted cow manure or bone meal than is necessary for most of the other bulbs. The pots should be kept in a cool, dark place and sparingly watered for a period of six weeks to two months, so that roots may develop. Then the flower stalk (or stalks) will appear; and the plant may be brought first into the light, then into the bright sun; but it must not be subjected to high temperatures. After flowering is over, and danger of frost past, the plant may be put out of doors. It should have extra feeding until late August, then moderate watering until time for frost. When cold weather comes, it should be brought in (in the same pot until it really breaks out of it) and kept in a cool dark place until fresh growth again gives the signal that a new blooming period is ahead.

Other interesting and more unusual bulbs, which may be treated like "amaryllis" are the Jacobean-lily (*Sprekelia*), the Scarborough-lily (*Vallota*), both of South African origin, and the zephyr-lily, (*Zephyranthes*), from the warmer regions of America.

Jacobean-lily (*Sprekelia*)

McFarland photo

More Difficult Group

Freesias, and other bulbs requiring the same treatment, are an interesting but a rather more exacting group. Freesias should be planted in August or September, because five months are required from potting time to bloom. The largest bulbs will give the most satisfactory results; and if a succession of bloom is desired, some should be potted every two weeks from mid-August until the end of September. About ten bulbs may be put in a 5-inch pot, planted an inch deep, in a well-drained soil prepared as for cape-cowslips. They may be kept outdoors or in a partially shaded frame until there is danger of frost, then brought into a cool house or greenhouse. They should be watered sparingly until the growth is really vigorous, and they will need less water if they can be kept cool. When active growth begins, they need more water, and in addition, a weekly feeding of liquid manure or some commercial fertilizer. The stems of freesias are weak, and will need careful staking and repeated tying.

The slower-growing bulbs of this group are much more subject to aphis than those mentioned earlier; and as the sun begins to grow stronger, in late January and February, their foliage should be carefully watched. Even before trouble appears, an occasional spraying with nicotine is a good preventive measure. The bulbs may be kept and used a second year—after replanting in new, rich soil. The bulbs in this group require more patience, more careful watching, and more babying; but with proper care they are very satisfying. Freesias are lovely in their soft colorings: pure waxy-white, saffron-yellow, and other delicate pastel tints; and their fragrance repays a lot of work.

Other bulbs that may be treated like freesias are the wand-flower (*Sparaxis*), mostly orange, yellow, and purple; globe-tulips (*Calochortus*), solitary and pale-colored; Babiana, bearing clusters of small showy flowers of blue and purple; *Ornithogalum arabicum*, like a glorified star-of-Bethlehem, with clusters of long-lasting, star-shaped white flowers, with dramatically black, shiny, bead-like centers; and "African corn-lily" (*Ixia*). Of these bulbs, next to freesias, we have had most success and satisfaction with Ixias. They have stronger stems than freesias, and, in contrast with the gentle freesia colors, they come in strong vivid yellows, pinks, crimson, and scarlet. Without patient attention, the full success of these bulbs is doubtful; but all of them are worth a trial.

McFarland photo

Ixia

OTHER ARTICLES ON BULBOUS PLANTS

Published earlier in PLANTS & GARDENS

In the Autumn issue, 1946 (Vol. 2, No. 3):

- Calochortus, by Elmer C. Purdy, pp. 170–173.
- American Daffodil Selections, by Jan de Graaff, pp. 180–184.
- Some Hybrids of Lilium Willmottiae, by F. L. Skinner, pp. 185–186

PERENNIALS FOR AUTUMN PLANTING

Safer for the plants, easier for the gardener

Gertrude M. Smith

THE pleasant weeks of autumn are an excellent time for planting other perennials in addition to the bulbs usually thought of at this time. Several popular garden plants are moved far more successfully in the fall than in the spring.

The bleeding-heart (*Dicentra spectabilis*), so lovely with spring bulbs, has ripened its foliage by late summer. So, too, has the Virginia bluebells or cowslip (*Mertensia virginica*). At this season these plants are easily shipped long distances without injury, but in the spring their early brittle growth is easily damaged.

Peonies also start growth early and are best planted in the fall. Although many are sold at other seasons, they can be shipped safely only when they are dormant, and the plants should be divided only then.

Among our native plants that are sold for woodland plantings, many ripen their foliage during the summer and are best handled during the autumn. The May-apple (*Podophyllum peltatum*), bloodroot (*Sanguinaria canadensis*), trilliums, Solomons-seals (*Polygonatum*), false Solomons-seals, or "Solomons-plumes" (*Smilacina*), and Jack-in-the-pulpit (*Arisaema triphyllum*) are well adapted to garden use.

All of these plants appear in the autumn as durable storage roots, sometimes bulbous or tuberous. They must be kept in good condition until they can be put into the ground. They are more subject to injury from drying than are such bulbs as tulips and daffodils; they should be kept damp but not soggy, and cool but not subject to frost. Planting should not be unnecessarily delayed. Early fall planting not only lessens the weakening of the roots, but allows more time for feeding roots to form while the ground is warm enough to permit plant activity.

Other perennials that are conveniently planted in the autumn are blue phlox (*Phlox divaricata*), varieties of the summer perennial phlox (*Phlox paniculata*), wild indigo (*Baptisia*), astilbes, Shasta daisies, pyrethrums, leopards-banes (*Doronicum*), *Polemonium reptans*, day-lilies (*Hemerocallis*), plantain-lilies (*Hosta*), the larger speedwells (*Veronica*), and various irises (although bearded iris is best planted in summer). Pansies, planted in the fall, where they are to bloom in the spring, develop into fine big plants.

Many perennials may be planted with equal safety in spring or fall. But spring is usually a time of feverish activity for the enthusiastic gardener, and any work that can be transferred to fall eases the rush.

Chrysanthemums winter over better if they are planted in the spring, but it is quite possible (when plants can be obtained locally, or raised on an extra piece of ground) to move them in the autumn when they are coming into bloom. Careful digging and watering are, of course, essential.

Some that should not be planted in the fall

Plants with shallow roots and those that keep their foliage over the winter are apt to heave out of the ground or to rot if they are planted late, and so they are best left until spring. Among these are the small garden pinks, such as

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Spring bloom from autumn planting

varieties of the cottage pink (*Dianthus plumarius*) and the maiden pink (*Dianthus deltoides*); also golden-tuft (*Alyssum saxatile*), aubrieta, and the varieties of moss-pink (*Phlox subulata*). It is a good rule to leave for spring planting the latest-blooming perennials, and those that are considered a little difficult to grow in the particular garden under consideration.

A WINTER GARDEN

Flowers from September to April, and shrubs ornamental when not in bloom

Estelle L. Sharp

"THE gardener's autumn begins in March with the first faded snowdrop," says Karel Capek in his delightful book, *The Gardener's Year;* conversely, a garden can begin with the autumn-blooming crocus (a true *Crocus*) and *Sternbergia lutea.* Such bulbous plants as these and the autumn-crocus (*Colchicum*) start truly a new cycle of growth. The many plants of the temperate zone that go to rest in the autumn have activity in their roots for many weeks before the spring display of flowers. Those plants that bloom in the fall and early winter go through a similar preparation period in the spring and summer months; then, with the arrival of the fall rains (after a dry summer during which they are apparently dormant), these plants are ready to blossom; and they produce their foliage later.

Since "spring" comes to these plants in autumn, it is to our advantage to grow as many of them as do well in our particular localities, and so lengthen the blooming season of our gardens. A winter garden may begin in September and continue to be of interest through early April. With the exception of periods of deep snow and zero temperatures, there can be flowers in bloom in every winter month. Each season some new varieties must be tried; what is hardy in one place may winterkill even in a more southern latitude with a different type of soil and exposure. One may grow *Iris unguicularis* for three years to the envy of his friends, and the fourth winter see it no more.

Location and Plan

Because of its very nature, this garden must be near the house, not only for

Snow—nothing to snowdrops!

Conrad B. Link

its protection but also for its owner's enjoyment from the windows; it cannot be like many summer gardens, with bits of this and that scattered here and there. There must be a plan, and it must look well throughout the year, although the summer months are less important.

Before digging is begun, even before plants are ordered, some time should be spent in study at the window from which the garden will best be seen. Perhaps the plan can center around a tree, or around a bird-feeding station planted with berried shrubs. Sometimes a simple border against a house wall is most attractive.

Shrubs and Ground Covers

A vine or shrub trained against the wall adds interest in winter, especially if the winter jasmine (*Jasminum nudiflorum*) or the orange-berried firethorn (*Pyracantha*) is chosen. The jasmine will bloom in mild spells any time from December on. It must be given some support and it needs a severe pruning every spring; but otherwise it is a very undemanding shrub, and looks well throughout the year. Firethorn berries are generally colorful through the winter and are not too popular with the birds. The shrub sometimes dies back in severe climates, but it is worth a trial in a protected corner. Forsythia, trained against a wall, gives much the same effect as jasmine, and it will bloom earlier than when planted out in the open.

Other flowering shrubs such as the Japanese witch-hazel (*Hamamelis japonica*), the Chinese witch-hazel (*Hamamelis mollis*), and *Daphne Mezereum* (both purple and white), are winter-blooming. Shrubs with colored bark, like the red-stemmed dogwoods, the green-branched *Kerria japonica*, and the thorny trifoliate-orange (*Poncirus trifoliata*) are interesting material if there is enough space for them. Drooping leucothoe (*Leucothoe Catesbaei*), with its bronzy evergreen foliage, is much more attractive than rhododendron, which always looks shriveled on a really cold morning.

Berried branches of firethorn (*Pyracantha*)

For a small tree, the starry magnolia (*Magnolia stellata*) can hardly be surpassed, especially when it is planted so that its showy white flowers can be seen against a background of evergreens. There is also a pink variety. The gray bark is pleasant to look at all winter, and the furry buds give promise of what is to come in March.

Having chosen the background or accent plants from such as these, it is then time to give thought to the appearance of the beds. It must be remembered that a planting of crocuses and snowdrops, lovely as it can be in February and March, leaves nothing but a bare spot later in the year. The beds should be planted with some shallow-rooted ground cover. Ivy and pachysandra are too heavy for delicate bulbs to push through; so also is periwinkle (*Vinca minor*). The double tunic-flower (*Tunica*), the harebell (*Campanula rotundifolia*), and Johnny-jump-ups or pansies are generally satisfactory for the purpose. Sedums may be used, with restraint. Whatever plants are chosen, they must not form a too solid mat. There must

Conrad B. Link

Snowdrops

be interspaces for the bulbs. Often a narrow band of a small-leaved form of ivy around the edge of the beds will give a good effect if it is kept trim and in place.

With these plans settled, catalogs may be studied for early-blooming bulbs and plants. Some are expensive, but they need not be bought by the hundred or even by the dozen. It is amazing how quickly some bulbs multiply; from a beginning of two or three, or even one, a nice little stock may often be built up in a few years. There is another side to the story as well. Many of the early tulips, for instance, have a way of running out or disappearing; but those that do well can be retained, and the more delicate ones replaced if they seem worth it. Every gardener has a list of plants not worth trying again along with his list of musts and things to try.

Snowdrops and Crocuses

Snowdrops and crocuses are the indispensable bulbs. There are many varieties of both, and many should be tried. Beware of mice and shrews when it comes to crocuses.

The first snowdrop to bloom in my small collection is *Galanthus cilicicus.* Over a period of eight years the blooming dates range from February 4 to March 16. Frequently the buds push up beneath the snow, a fact that makes it a little difficult to keep exact records of the first blossom. Snow does not seem to injure them; but sheets of ice, which often occur in February and March, leave even a snowdrop a trifle the worse for wear. *Galanthus byzantinus* comes about the same time as *Galanthus cilicicus.* February 4 is the earliest, March 5 the latest date of the first open flower. The leaves of this kind are broad, with a folded edge, and would never be taken for those of the common snowdrop. The flower is larger, too, and has an extra green spot.

The giant snowdrop (*Galanthus Elwesii*), also a large-flowered species, and one commonly grown, has never done so well with me as some others. It blossoms early, February 9 to March 1, but does not multiply. As it comes from stony slopes on the mountains of Asia Minor, perhaps my level clay soil explains its inability to prosper.

A variety of the common snowdrop (*Galanthus nivalis*) is one called Scharlokii. William Robinson writes that it was named by Caspary in 1868 after Julius Scharlok who discovered it growing in the valley of the Nahe, a tributary of the Rhine. This is a very distinct little flower with a divided spathe that stands up like two little leaves. It increases well and blooms early but does not stand up well in stormy weather. The stalk is long and rather weak, and so the flower is frequently bent down into the mud or snow. But it has a certain charm and is worth special protection in bad weather. Snowdrops seem to thrive best when planted among roots of deciduous trees.

Crocuses need a sunny location, and do better away from tree roots. These flowers are even more appealing than snowdrops because of their warmth of color. *Crocus Sieberi,* which fortunately does not seem to be eaten by shrews, is the earliest. If planted in a protected spot, near a step or wall where the sun shines, it may come as early as the end of

McFarland photo

Pasque-flower (*Anemone Pulsatilla*)

January. It has lavender flowers, tiny to be sure, but nevertheless real outdoor bloom. *Crocus moesiacus* (or *Crocus aureus*), cadmium-orange in color, is a beauty, blooming from February 21 to March 14, but it is popular with the rodents. *Crocus Imperati* cannot be left unmentioned, for it is one of the most beautiful, with its pale buff outer segments opening up a glorious purple within. February 23 is the earliest blooming date recorded, March 18 the latest, from 1933 to 1945.

Christmas-rose and Narcissus

The Christmas-rose (*Helleborus niger*) and the winter aconite (*Eranthis hyemalis*) belong in every winter garden. The latter comes up through the snow with its frilly green collar; and, in a suitable location, it will spread slowly over a large area. The Christmas-rose, with its dark evergreen leaves, does well in a cool soil in partial shade, and should not be disturbed. With me the blossoms begin in early November and continue well into the winter. The Lenten-rose (*Helleborus orientalis*) and the hybrids bloom in March. *Helleborus orientalis* var. *atrorubens,* with purple flowers, dull on the outside and greenish purple inside, blooms about the middle of March. I have found seedlings under the parent plant which seem to suggest that it is in a suitable location—one receiving little sunlight except for a short time in the morning and again late in the afternoon. All of the hellebores must be watered during dry spells. They wilt very quickly if strong rays of the sun strike them.

Dwarf narcissus and tulip species are valuable for the late winter. The tiny trumpet daffodil, *Narcissus minor minimus* (*Narcissus Pseudo-Narcissus minimus*), only 4 inches high, charms everyone. March 5 is the earliest date for flowers to be fully open, though they often show color in the bud for a long time before blooming. The sparrows seem to be the only pests that bother them; occasionally flowers are destroyed by the birds pecking at them. The few bulbs bought in 1936 have been divided several times and tried in different locations, but they always seem to do best under the starry magnolia. *Narcissus minor nanus* (or *Narcissus Pseudo-Narcissus nanus*), slightly larger than *minimus,* has been planted several times but dies out in my garden. *Narcissus minor* itself (*Narcissus Pseudo-Narcissus minor*) blooms about March 20. It did well for four years; but when divided, failed to bloom for three years. The tiny *minimus* has been much the most successful of these three.

A Few at the End of the Winter

The tulip species, as I have said, are never very permanent but are well worth trying. *Tulipa praestans, Tulipa biflora* var. *turkestanica,* and *Tulipa polychroma* have been the earliest to flower and the most lasting of about a dozen species which I have grown.

The early bulbous *Iris reticulata* opens suddenly in March. The spring snowflake (*Leucojum vernum*) is larger than any of the snowdrops, and is easy to grow; but it should not be planted near a stone wall because it does not do well in a place that is too dry. The tiny early spring adonis (*Adonis vernalis*) is not difficult to raise from seed. The Pasque-flower (*Anemone Pulsatilla*) comes at the end of winter; and glory-of-the-snow (*Chionodoxa*) and water-lily tulips (*Tulipa Kaufmanniana*) can be counted on for the swan song of the winter garden.

Ed. note: Plants mentioned in the foregoing article should be planted as follows:

AUGUST OR SEPTEMBER

- Autumn-crocus (*Colchicum*)
- Crocus (*Crocus*), autumn-blooming
- Fall-daffodil (*Sternbergia lutea*)

SEPTEMBER TO NOVEMBER

- Crocus, spring-blooming
- Glory-of-the-snow (*Chionodoxa*)
- *Iris reticulata* and *Iris unguicularis*
- Narcissus
- Snowdrop (*Galanthus*)

- Snowflake (*Leucojum*)
- Tulips

APRIL TO MAY

- Christmas-rose (*Helleborus niger*)
- Harebell (*Campanula rotundifolia*)
- Ivy
- Lenten-rose (*Helleborus orientalis*)
- Pachysandra
- Pansy (*Viola*)
- Pasque-flower (*Anemone Pulsatilla*)
- Periwinkle (*Vinca minor*)
- Sedum
- Tunic-flower (*Tunica*)
- Winter aconite (*Eranthis*)

MARCH TO MAY

- All woody plants mentioned

Water-lily tulips (*Tulipa Kaufmanniana*)

McFarland photo

SOMETHING UNUSUAL—

THE CHILEAN BELLFLOWER

A challenge to North American growers

Oscar Galeno

A KALEIDOSCOPE of many beautiful colors and varieties of flowers spreads through the dense forests of southern Chile between parallels 29 and 42. No wonder the Chileans allude to it in their National Anthem: "And thy fields embroidered with flowers are the felicitous image of Eden." Americans touring this region call it the California of the South. Marvelous, indeed, is the display that nature presents with the flora over that region of the world, isolated by the Pacific on one side, by the Andes Mountains on the other, and toward the north by a desert; the last is land saturated with saltpeter—a fertilizer, but, by a paradox of nature, so concentrated that it kills all vegetation.

Home of the bellflower: Chile

Drawing by the author

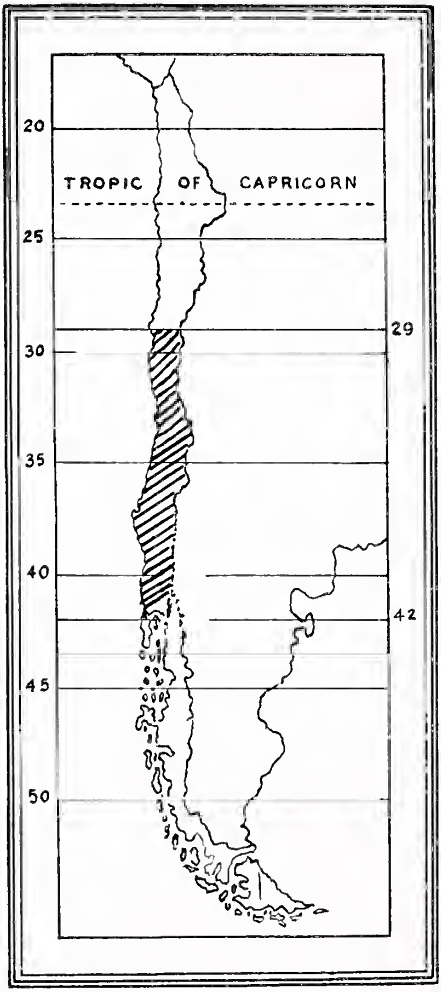


Photo by the author

Chilean coin with bellflower design

Covering the O'Higgins Province, from parallel 34 to 41, the flower which attracts most attention for its beauty, grace, and color combinations is the Chilean bellflower, or copihue (*Lapageria rosea*). It was named after Josephine Tascher de La Pagerie, an ardent botanist. There is but a single species, an exceptionally graceful half-hardy evergreen climber, related to Smilax, and considered one of the most beautiful climbing plants in existence. It blooms, in its native country, between the months of February and April, but it sometimes produces a few flowers in December and January.

The flowers are about three inches

long, bell-shaped and gracefully rigid, hanging singly or in clusters, often at the ends of the branches. The oval yellowish fruit is edible.

There are several varieties of copihues. The type, *Lapageria rosea*, has deep red flowers with lighter spots; var. *alba* (or *albiflora*) is pure white; var. *superba* is large, and of a brilliant rich crimson hue; and var. *alba delicta*, a new variety, has large pale bluish flowers with pink veins. The type is the most striking because its lighter spots make it more noticeable; but the other varieties are just as beautiful in their delicate coloring.

The Chileans, in their great admiration for the copihue, have not only selected it as their national flower, but have put a graceful outline of it on all denominations of their copper coins.

Chilean bellflower: young plant climbing high in lath house

Photo by the author

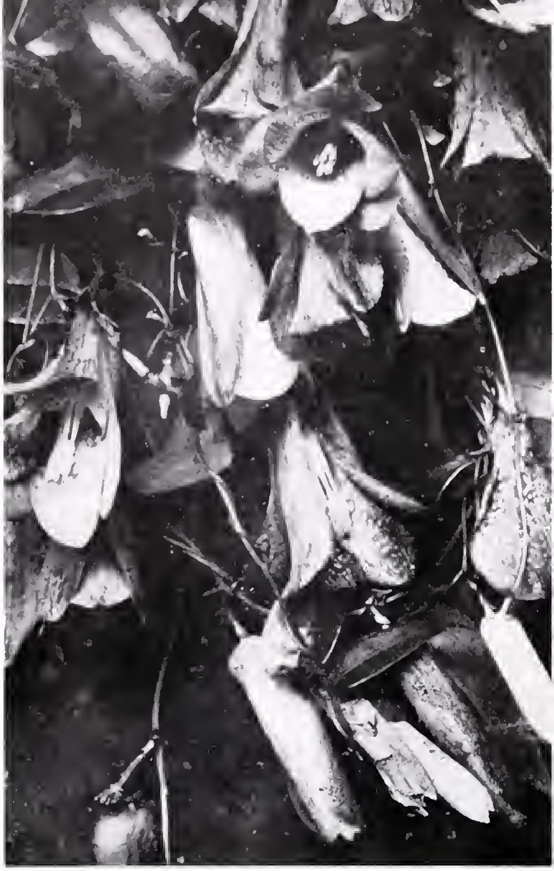


Photo by the author

A cluster of bellflowers

Bailey's Cyclopedia of Horticulture recommends that the Chilean bellflower be cultivated oftener in the United States, as it is an excellent climber for cool greenhouses, or for outdoor growing in mild regions. It will not stand frost. It blooms here from October to December. It is not easy to grow, but it is well worth extra care. It must have shade and good drainage. It is propagated by layering (best), or by cuttings; it may also be grown from seeds, but varieties may not come true. It is now grown in a made-to-order lath house on the campus of the University of California at Berkeley; and a special section has been set aside for it in the new arboretum in Golden Gate Park, San Francisco.

PLANTAIN-LILIES

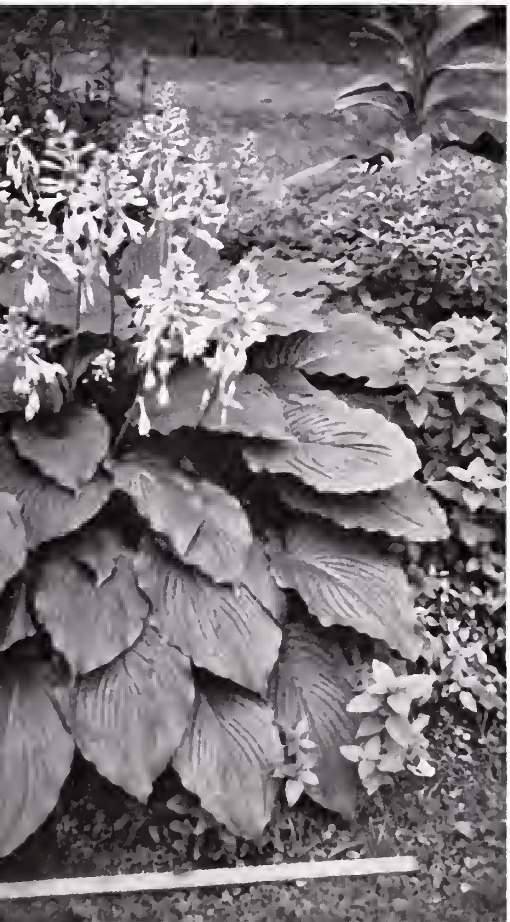
Good plants for shady gardens

Frances H. Williams

PLANTAIN-LILIES (species and varieties of *Hosta,* formerly called *Funkia*) respond amazingly to treatment that suits them. They need heavy feeding, partial shade, and moisture. They are valuable plants for the shady garden, but must have space to grow to the full beauty of their foliage.

Hosta Fortunei var. *gigantea*

Photo by the author



One plant of the large kind will become, in six or eight years, a magnificent mound of leaves, 2½ to 3 feet high and 5 or 6 feet across. Thus it can be a prominent accent in the garden; or a number of them can make a massive background for other plants. The leaves make a good contrast with the finer foliage of many other plants, such as spireas, ferns, mints, and feverfew. Early spring bulbs can be planted among the plantain-lilies: squills (*Scilla*), glory-of-the-snow (*Chionodoxa*), and *Ornithogalum nutans* do well.

The tall-cluster plantain-lily has its flowers on stalks extending above the foliage. In the short-cluster type, the flowers are somewhat hidden under the leaves.

The medium-sized plantain-lilies, because of their neat growth, are good accent plants for the mixed border; or they may be used to make wide borders for flower beds, paths, or lawns. A single plant of this group can grow into a rosette 2 or 3 feet across in a few years. The two small kinds catch the eye as incidents in the flower bed.

Plantain-lilies in general add restfulness to the garden; and the large kinds, with their broad leaves and stately growth, add dignity. The forms with variegated leaves give the effect of dappled light, as if the sun were glinting through, and light up the garden even on a cloudy day.

Plantain-lilies stand city conditions well; but it is helpful to wash off the soot occasionally. The large-leaved kinds need this more than the small-leaved ones. The smaller varieties will stand more sun than the larger. If the shade is too dense, the flowers will be few; but the leaves fill many a planting need in dark corners.

On the whole, plantain-lilies are healthy plants if they are given heavy feeding with compost, dried cow manure, and bone meal. The fertilizer should be dug down below the roots. The crown of the larger kinds should be an inch or more above the level of the ground, so that water will not settle around the plant.

If there are several kinds of plantain-lilies in a garden, interesting self-made hybrids may result. Seedlings from green-and-white varieties usually have plain green leaves.

The first plantain-lilies begin blooming in early July, and the flowering period for each kind lasts about two weeks. With a proper selection of varieties, one can have plantain-lilies in bloom practically all summer, and even until the middle of October.

List of Plantain-lilies

Arranged by size and by dates of blooming in Massachusetts

LARGE PLANTS FOR MASS EFFECTS

Short-cluster plantain-lily (*Hosta Sieboldiana*). Early July. Heavy, thick leaves with thick stalks, very gray, 28 inches tall; flowers almost white, bunched towards the end of the stalk, under the leaves; 4- to 5-foot spread for 8-year-old plant. An arresting area of gray color.

Tall-cluster plantain-lily (*Hosta Fortunei* var. *gigantea*). Early July. Large dark green leaves, gray beneath, 3 feet high; very pale lavender flowers along 3½- to 4-foot stalk; 5- to 6-foot spread of leaves for 8-year plant. Massive and impressive plant.

Tall-cluster plantain-lily (*Hosta Fortunei* var. *marginato-alba*). Early July. Large shiny green leaves with cream

Hosta Fortunei var. *marginato-alba* (with var. *gigantea* at right)

Photo by the author

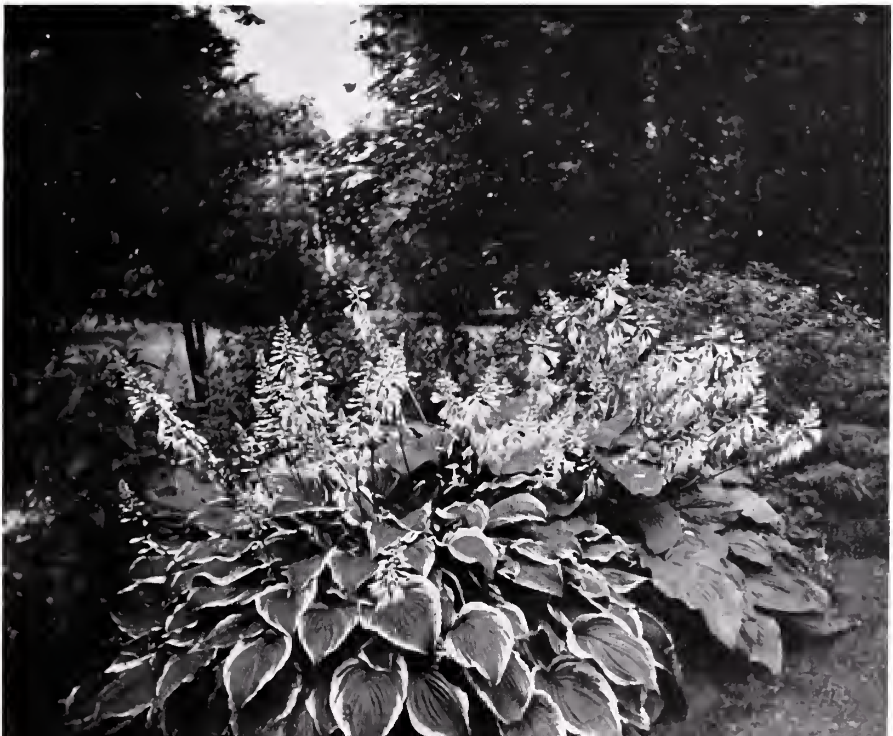


Photo by the author

Hosta undulata

border, 2½ feet tall; very pale lavender flowers along 3- to 3½-foot stalk; 4- to 5-foot spread. Beautiful mound of green and white.

Midsummer plantain-lily (*Hosta erromena*). Middle of July. Green leaves, 1½ feet long; lavender flowers on 3- to 3½-foot stalk; no seed pods. Coarse growth for odd corners.

Tall-cluster plantain-lily (*Hosta Fortunei*). Late July. Grayish leaves, thick texture, 30 inches; pinkish-lavender flowers; stalk 3 feet; 5- to 6-foot spread in six to eight years. Handsome mass of foliage.

Blue plantain-lily (*Hosta caerulea*). Late July. Shiny dark green leaves with twisted tip, 1½ feet; flowers purple with white lines, on 3-foot stalk. A good heavy border plant.

Fragrant plantain-lily (*Hosta plantaginea*). Late August. Light green shiny leaves, 1½ feet; flowers pure white, 4 to 5 inches long, above the leaves. Grows slowly and needs a little protection, but will spread to a large clump, 5 feet or more across. Fragrant, shining flowers in the evening light.

MEDIUM-SIZED PLANTS FOR BORDERS

Wavy-leaved plantain-lily (*Hosta undulata*). Early July. Green leaves splashed with white, about a foot tall; flowers pale lavender, on 2½-foot stalks; no seeds. For borders of flower beds and long walks.

Narrow-leaved plantain-lily (*Hosta lancifolia* var. *albo-marginata*). Middle of August. Light green leaves with white edges, a foot long; flowers laven-

Hosta lancifolia var. *tardiflora*

Photo by the author

der, on erect 24-inch stalk. A neat, freely blooming border plant.

Blunt plantain-lily (*Hosta decorata*). Middle of August. Oval leaf with wide white edge, 1 foot; purple flowers with white lines, on 18- to 24-inch stalk; spreads by runners. A very handsome rosette.

Narrow-leaved plantain-lily (*Hosta lancifolia* var. *fortis*). Late August and September. Pointed dark green leaf, 1 to 1½ feet; scattered lavender flowers on 18-inch stalk; few seeds. A strong green for odd corners or long borders.

Dainty Plants for Incidents

Hosta minor (trade name). Early September. Light green, narrow leaves, to 1 foot long; pure white flowers, 2 inches, on 12- to 18-inch stalk. Very dainty; pleasant near the fragrant plantain-lily.

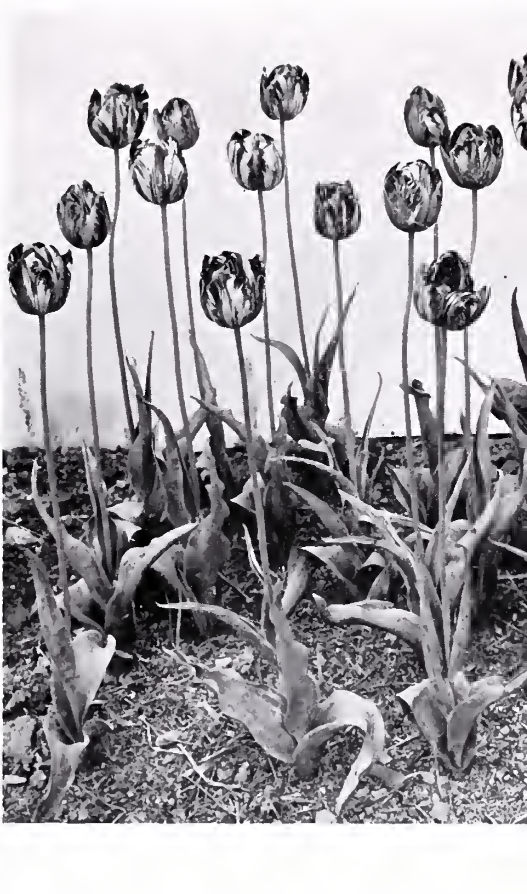
Hosta lancifolia var. *tardiflora*. Middle of October. Very dark green leaves, stiff and pointed, 6 inches long; bluish-lavender flowers, bunched at the end of 1-foot stalk; flowers hold up under some frost; plants need a little protection. Valuable for late bloom.

"BROKEN" TULIPS

A "broken" tulip is one that produces a flower striped or feathered with red, cerise, purple, or some related color, on a white or yellow background. This "breaking" in the inherited color of a tulip flower is caused by a virus, and is really a disease. Once a plant has the virus, it and its progeny will always show striping. The disease is not serious, however, and many "broken" varieties are known in the trade and grown regularly. Growers keep such varieties separated from other tulips.

The presence of a "broken" tulip in a planting will serve as a source of infection for others. Aphids are known to carry the virus from plant to plant, and so insect control is important in preventing the spread of the disease. The best preventive, however, is to destroy the infected plant. If the "broken" tulip does not have a pleasing pattern that the grower is willing to see in other tulips of the same variety, it should be dug out.

"Broken" tulips, as a group, have lost their popularity in recent years, as most gardeners prefer tulips of solid color.



A "broken" tulip: Bonaparte

WITHIN THE BROOKLYN BOTANIC GARDEN

RETIREMENTS AND DEATHS

In the past twelve months the Brooklyn Botanic Garden has lost, by death, three of its greatest long-term friends, and by retirement two of its senior staff members. Both retiring staff members are now Curators Emeritus.

Retirements

Dr. Arthur Harmount Graves. Most recent was the retirement (July 1) of Dr. Arthur H. Graves. Widely known for his work in breeding disease-resistant chestnut trees, Dr. Graves left the Garden after twenty-six years as Curator of Public Instruction. While at the Botanic Garden, Dr. Graves emphasized the importance of outdoor instruction in plant life. The number of his former students runs into the thousands. Many of the biology and science teachers of Greater New York received part of their training in his classes.

Ginkgo trees: part of Benson memorial planting

Author of many scientific papers on the diseases of North American forest trees, Dr. Graves is continuing his researches, begun in 1910, in cooperation with the United States Department of Agriculture, on a fungus disease which has caused the virtual extinction of the American chestnut tree. Experiments at his chestnut tree plantation on the Sleeping Giant Mountain, Hamden, Connecticut, will lead, Dr. Graves believes, to the development of a disease-resistant, timber-type chestnut tree within ten years. His new permanent residence is Wallingford, Connecticut.

Dr. George Matthew Reed. The retirement of Dr. George M. Reed ended a period of more than twenty-five years in which he was Curator of Plant Pathology at the Garden.

His major interests were in the smut diseases of cereal grasses and in the breeding of new varieties of iris. He also spent much time on the Garden's flowering cherry and crab apple collections.

Dr. Reed's special interest in Japanese irises led him to visit Japan in 1930 to study these varieties in their native environment. He was largely responsible for the establishment, in 1935, of the Farmingdale Iris Garden, a cooperative project of the State Institute of Agriculture at Farmingdale and the Brooklyn Botanic Garden. Upon the death of the Garden's first Director, Dr. C. Stuart Gager, in August 1943, Dr. Reed was appointed Acting Director of the Garden, a position he filled until the appointment of Dr. George S. Avery, Jr., in July, 1944.

Until his retirement in October, 1946, Dr. Reed was in charge of publication of Plants & Gardens.

Part of newly planted yew hedge—started by Philip A. Benson

Deaths

Miss Harriet H. White. By the death of Miss Harriet H. White on February 10, the Garden lost one of its founders and most generous supporters. Miss White was one of the anonymous donors who made the establishment of the Brooklyn Botanic Garden possible by offering in June, 1910, to contribute $50,000. And every year after the beginning of the Garden she contributed generous sums for specific projects and for the general scientific and educational work of the Garden. Miss White's deepest interest was in the promotion of human well-being and happiness, as evidenced by her participation in almost every movement for the cultural and civic welfare of the Borough in which she spent her life. In this she carried on to the last the high tradition established by the White family. She endeared herself to all who knew her by her depth of understanding, her kindness, and her desire to share her resources to make the world a better place in which to live. Her benefactions were so many and so quietly and anonymously given that few citizens of Brooklyn were aware of their extent.

During her lifetime Miss White arranged for the Garden to have a continuing income after her death, so that the work she found so closely connected with human betterment and daily living might go on. A generous share of her support has always gone and will continue to go toward scientific research.

Philip Adolphus Benson. At the time of his death on October 16, 1946, Mr. Philip A. Benson was Chairman of the Governing Committee of the Botanic Garden, a post he had held for nearly three years. He was a Trustee for eleven years and had served on several special committees.

There are now two living memorials to Mr. Benson. One of these—nearly a quarter of a mile of new yew hedge—was started by a gift from Mr. Benson, and completed after his death by five of his closest friends among the Trustees. Another living memorial was established by officers and trustees of Savings Banks of Brooklyn and Queens. This memorial takes the form of a hedge of more than 100 ginkgo trees planted along the border of the Garden next to the Brooklyn Museum. Mr. Benson was for many years President of the Dime Savings Bank of Brooklyn.

Edward Charles Blum. For nineteen years Mr. Edward C. Blum was Chairman of the Board of Trustees of the Brooklyn Institute of Arts and Sciences, a post he held until his death on November 20, 1946. On numerous occasions Mr. Blum rendered distinguished service to the Botanic Garden. All who were associated with him miss his unfailing interest in and devotion to the affairs of the Garden and the Institute as a whole.

FURTHER GIFT TO MEMORIAL GARDEN

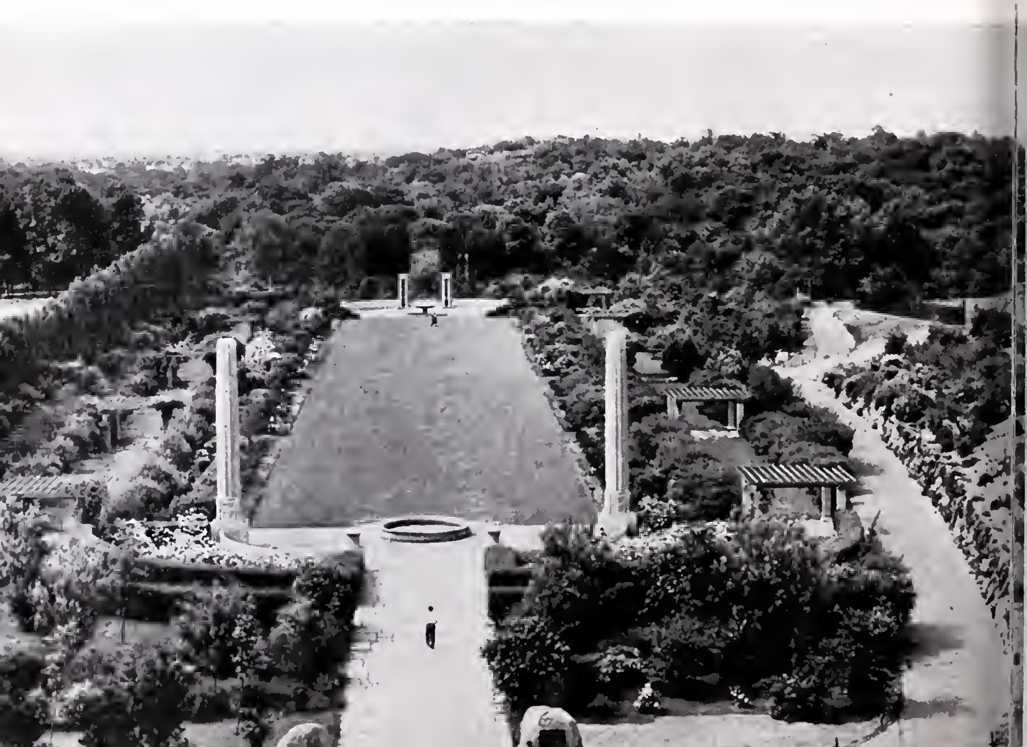
Visitors to the Osborne Memorial section of the Garden (the horticultural section) will be greeted by a blaze of color next spring as a result of the gift by Mrs. Osborne of more than 1200 azaleas and rhododendrons. The Osborne Memorial was a gift (in 1939) of Mrs. Sade Elisabeth Osborne in memory of her late husband, Dean Clay Osborne.

The plants represent her entire azalea and rhododendron collection, which for many years made the Osborne home on St. Mark's Avenue a show place in Brooklyn.

The plan for the new planting, arranged so as to provide large masses of color, was drawn up by Miss Alice Recknagel, Landscape Architect. The Department of Parks of the City of New York, and Hicks Nurseries assisted in the transplanting. The work was begun June 10 and completed July 1.

This fine collection of azaleas and rhododendrons comes from a long-time friend of the Garden and Trustee of the Institute. Her generosity has done much to increase the beauty of The Brooklyn Botanic Garden.

Osborne Memorial Section



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OF
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Director of the Botanic Garden

GEORGE S. AVERY, Jr.

TO VISITORS

To reach the Garden:

By Subway: from Manhattan, twenty-five to thirty minutes' ride from Times Square or Grand Central: **I.R.T., West Side** (7th Avenue or Broadway–7th Avenue line), downtown express marked "News Lots Avenue" or "Flatbush Avenue," to Eastern Parkway–Brooklyn Museum Station; **I.R.T., East Side** (Lexington Avenue line), downtown express marked "New Lots Avenue" or "Utica Avenue" or "Atlantic Avenue," to Nevins Street, step across platform and change to 7th Avenue or Broadway–7th Avenue train; **B.M.T.** Brighton Beach train to Prospect Park Station.

By Automobile: from points on Long Island take Eastern Parkway westward, and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway; follow the Parkway to Washington Avenue, then turn right.

BROOKLYN BOTANIC GARDEN RECORD

PLANTS & GARDENS

Winter, 1947

Digests of
the Year's Highlights
in
Horticulture and Gardening

—

Varieties of
American Holly

—

Guide to
Recent Non-technical
Books and Articles
about Plants

Vol. [illegible] NEW SERIES No. [illegible]

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DR. GEORGE S. AVERY, JR., Director of the Brooklyn Botanic Garden.

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DOROTHY WAUGH, Director of Public Relations, Free Public Library, Montclair, New Jersey.

The late T. A. WESTON of New York and Hillsdale, New Jersey, for many years Associate Editor of the *Florists' Exchange* and a regular contributor to many magazines and newspapers. This article was the last he wrote for *Horticulture.*

PLANTS & GARDENS

Spring Adonis (*Adonis vernalis*)

New Series
Winter, 1947
Vol. 3—No. 4

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JOHN C. WISTER, *Editor*
Michalena L. Carroll and Hester M. Rusk, Assistant Editors
The editors were assisted in the preparation of this issue by Elizabeth Clarke, Conrad B. Link, and Gertrude M. Smith.

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Light and shadow among tropical plants. Brooklyn Botanic Garden

Except where otherwise credited, photographs by Louis Buhle

THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
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Winter 1947

Readers of PLANTS & GARDENS, Everywhere:

We have tried to time the mailing of this winter number so that it would avoid the rush and confusion that so often accompany the Christmas season. Holiday festivities and extra-busy schedules are not conducive to peaceful fireside gardening.

This winter issue, following our usual tradition, is given over to the year's articles of outstanding interest and significance. They come from a wide selection of magazines, some of which might not be generally available to our readers. Every article appearing here, "Readers' Digest" style, is worthy of a permanent place in your library of gardening and horticulture. It is a privilege to honor the authors and publishers of the original articles by selecting them for presentation in PLANTS & GARDENS.

Greetings for the New Year from the Garden family.

Sincerely yours,

George S. Avery, jr.

Director

The Gardener's Beatrice Fairfax

or

HOW TO USE A BOTANICAL GARDEN

They are not only outdoor museums, they are practical service stations for gardeners. Are you getting all the help you can from the one nearest you?

Dorothy Ducas

Condensed from *House Beautiful*, March 1947

HAVE you ever really used a botanical garden? If you live near a botanical garden or arboretum, undoubtedly you have visited it. But what has it meant in terms of improving your own flower garden and your shrub plantings at home? Botanical gardens not only are educational institutions, scientific research centers, and public parks. They are also advisory centers for anybody who wants to grow things himself, sources of new ideas for home gardens, gold mines of information and inspiration for our own grounds, large or small, if we choose to make them such.

If you had any problems in your mind this past year (and who hasn't?), you could have turned to a botanical garden for help. Many of those who wanted answers just never thought of the botanical garden as a horticultural Beatrice Fairfax. The experts at botanical gardens are there to serve the public, as well as the world of science and the business of horticulture.

There are all kinds of botanical gardens (about 89 in all) in this land of ours: large educational centers like the New York Botanical Garden, The Brooklyn Botanic Garden, and the Missouri Botanical Garden; planted or natural areas specializing in trees, of which the Arnold Arboretum in Massachusetts is the most outstanding; and small botanical gardens displaying only a few special features such as tropical plants, wildflowers, or roses.

To enlarge your garden horizon, here are four specific suggestions:

- Locate the botanical garden nearest you, visit it often, especially at those times of the year when its special features are at their prime.
- Telephone, call in person, or write to the botanical garden when you have a problem you can't solve alone.
- Join a botanical garden and receive its monthly literature. Attend its lectures and classes if you live near enough.
- Visit other botanical gardens when you are on a holiday or business trip.

To find out where all the botanical gardens and arboretums are located, consult the *Brooklyn Botanic Garden Record* for July, 1938, which lists the botanic gardens of the whole world.* You may find this volume in your local library, or you can buy one from the Brooklyn Botanic Garden. From it you can decide where to go on a tour.

We were surprised at the variety and numbers of questions asked of botanical gardens by laymen, not counting the many scientific inquiries. Opening the daily mail is not dull at a botanical garden. Dr. George T. Moore at the Missouri Botanical Garden recently had a request from Leyden, Holland, for a cutting which cost $45 to transport by air. A Yonkers man wrote him for some

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* "Arboretums and Botanical Gardens of North America," by Donald Wyman, published by Chronica Botanica Co., 1947, contains recent information.—Ed.

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Aloe vera leaves, a specific remedy for radium and x-ray burns. They are grown at the Botanical Garden.

Sometimes the Gardens anticipate your inquiries. Last summer the Missouri Botanical Garden had a hay fever exhibit, displaying (under glass, in deference to the sufferers) all the plants of the region responsible for various kinds of so-called hay fever allergies. The Brooklyn Botanic Garden has had a weed-killer demonstration for two years in a row, showing how commercial weed killers destroy weeds common to lawns, without damaging the grass. It also furnished the know-how for New York City's big ragweed destruction program in 1946.

Where to See What

The big botanical gardens are noted more for some things than others. You should know, in advance, what are the special treasures to view, so you don't inadvertently pass up a superb rose garden, hemlock grove, pinetum, or iris display simply by not knowing it was at its best there.

Possibly you may have a small home greenhouse, as an increasing number of amateurs have today. Ever thought of growing orchids? Missouri Botanical Garden, famous for its orchids, has 20,000 flowering plants of 1,200 distinct varieties in the greenhouses at Gray Summit, the 1,602-acre extension of the city garden, about 40 miles outside of St. Louis.

If it is trees, shrubs and woody plants you are interested in, you should see the Arnold Arboretum of Harvard University at Jamaica Plain, Massachusetts. The largest number of woody plants in the country are collected there—everything from azaleas, rhododendrons, and mountain-laurel to hemlocks and rare trees from Tibet and Manchuria. If you visit, ask which ones would be practical to try in your part of the country.

Mo. Bot. Gard. photo

Water-lilies at the Missouri Botanical Garden

The rock garden at the New York Botanical Garden has more than 1,500 species and varieties of plants, set out in varied situations such as full sun, cool shade, limey and acid soil, moraine, a streambank, a bog, a partly shaded bank. If you have wondered how to plant any of these special sites, why not find out what your botanical garden has discovered?

There is a flowering meadow at the New York Botanical Garden that flaunts wild flowers and perennials, mostly native, all summer long. The flowering meadow which is "tops" is at the Santa Barbara Botanic Garden in California. Thirty acres are given over to culture of native California plants. The meadow is a huge riot of color each spring. Mass

April at the New York Botanical Garden. Daffodil hillside

N. Y. Bot. Gard. photo

Josef Muench

Naturalistic planting of California-poppies and sea-dahlias at the Santa Barbara Botanic Garden plantings of California-poppy, lupin, sea-dahlia, beach-strawberry, and many others have been tried.

The Brooklyn Botanic Garden is known for its ornamental Japanese cherries. These are massed along the edge of a Japanese garden, where 40,000 to 50,000 people on a single Sunday walk under the trees—between April 1st and May 10th. Toward the end of this time, when the petals drop, it's like walking through pink snow.

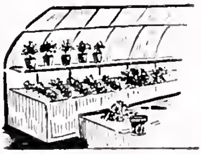
But Brooklyn is known best for its educational work, its children's program in particular, a really outstanding feature. Its summer gardens, in which 250 children annually raise their own vegetables in 10 × 10-foot plots, yielded in 1946 a quarter of a ton of beans and nearly two tons of tomatoes per half acre. Its Saturday classes from September to Christmas, and from March to June, plus weekly classes for thousands of school children make a thrilling example of practical use of a botanical garden.

"We believe this is one way for botanical gardens to be dynamic," said Dr. George S. Avery, Jr., director. "Such gardens really live, they are not merely museums. The key is to have people's lives collide with them. Cities need more space for this. They keep on building closer and closer together, and driving people out farther and farther. Ideas for use at home are a function of botanical gardens. But there must be some space at home in which to use the ideas. Nothing is important until it is incorporated into a pattern of living. I have never seen a child yet who could have his fingers in the earth that wasn't a square shooter. I believe the wider use of botanical gardens for children would do more to combat juvenile delinquency than some imagine."

One of the "Gardens within a Garden" at the Brooklyn Botanic Garden

The purpose of the children's program is more than to teach elementary botany. Miss Ellen Eddy Shaw, retired curator of elementary instruction at the Garden, once summed it up: "Classrooms, buildings, equipment and books are not the important factors of education in our children's work. We believe, with Comenius, that men should learn to know and examine things themselves, and not take the testimony and observation of others."

This sums up what we mean about using botanical gardens. We amateur gardeners should know and examine botanical gardens ourselves. We ought to include them as regular sources of information and inspiration, along with our garden clubs, horticultural societies, garden books and magazines. We'd know more about our own gardens—make them more truly beautiful—and better our living as a result.



THE NEW AGRICULTURE

Terracing, strip cropping, and contour plowing are essential

Louis Bromfield

Reprinted from *Home Acres,* June 1947

VERY slowly, over a period of thousands of years man has been learning about himself. Within the last century more and more progress has been made and, still slowly, he is beginning to learn that he cannot and never has existed independently of his environment and of the laws of God and of Nature which are essentially the same. In all of this the importance of the soil upon which he lives side by side with the plants and the animals which provide the means of his very existence has become more and more clear.

One of the greatest of discoveries, proven beyond any dispute, is the fact that poor or worn-out or eroded soil does not produce healthy or abundant crops or animals. Neither does it produce healthy and intelligent people, possessed of initiative and energy. Dr. Jonathan Forman, one of the great authorities on nutrition and allergies, has said, "We are what we eat!" Dr. Hugh Bennett, head of the Soil Conservation Service and one of our great Americans, has put it another way, "Poor soil makes poor people!" One might add that the statement is only the beginning and continue by adding, "Poor people make poor soil; poorer soil makes poorer people and so on in an unending vicious circle rolling always down hill toward final calamity."

Young orchard—contour planting

U. S. D. A. photo

M. M. Johnson photo

Neglected cornfield, filled with gullies showing effect of erosion

The surface of the earth is dotted with ruined cities, nations and civilizations which died when they wore out their soils or allowed them to be washed away. The list is long—China, India, Greece, Southern Italy, North Africa, the Near East, and large portions of new countries like the United States, Australia, and Venezuela.

The best symbol I know of what soil destruction can mean is a sight that GI's often saw in North Africa—miserable, ignorant, poverty-stricken, under-nour-

Published by The Woman's National Farm and Garden Association, 18044 Kentucky Avenue, Detroit 21, Michigan.

ished people sunning themselves listlessly in the marble ruins of the great cities which dotted the southern shore of the Mediterranean. The destruction of the soil in agricultural areas of the Roman Empire contributed certainly as much as any other factor to the downfall of a nation which once dominated the whole of the known world. But it was not economic alone in effect; with the soil went the vigor, the health, the intelligence of the people of the worn-out lands.

We now know enough to read and interpret all this evidence from the past and in it we are beginning to find the answer to many of the evils and even the disasters which threaten us in this New World, a world which measured in terms even of historic time is only a fraction of a second old.

We know that calcium, phosphorus and many other minerals are absolutely necessary to the health, vigor, and intelligence of peoples. The same is true of proteins which are essentially no more than nitrogen translated into terms of food for man and beast. We know that when any of these are lacking, health, vigor, and intelligence are imperiled. When all of them are lacking or existent in too small quantities, life itself cannot continue. We have in this once rich nation whole worn-out or eroded agricultural areas where the populations are listless, unhealthy, and subject to all kinds of disease, who are born and die without any hope of success, prosperity, or achievement because they have not in their flesh and bones, blood and brains, the minerals which could give them at least an even chance with people living in agricul-

U. S. D. A. photo

Gully reaching serious proportions

Contour plowing, terracing, and strip cropping

M. M. Johnson photo

U. S. D. A. photo

Large orchard planted on the contour

turally richer and more fortunate areas. Some of these people settled originally upon deficient soils which were minerally deficient and never real agricultural land and some wore out the land on which they lived by poor agricultural practices or by allowing the soil to be eroded or leached out.

Out of all the knowledge acquired during the last half century, there has grown up in this country a new kind of agriculture which can be the hope of our national future if it gains wide enough practice. It is an agriculture made up of ancient practices, learned painfully by man out of bitter necessity and experience—the necessity of finding enough food to keep alive. It is made up, too, out of the remarkable discoveries of new truths concerning the physiology of mankind and its relation to the soil upon which it lives. It is based fundamentally upon the principle of working with Nature rather than fighting her as so many American farmers have done in the past. It includes two or three main objectives: to keep the rainwater where it falls and where it is badly needed at certain seasons—rather than permitting or encouraging it to run off, rapidly carrying down flooding gullies the precious topsoil and minerals by which plants, animals, and man himself, all live. It is based upon the principle of returning to the soil as much or preferably more than man takes from it both of minerals and of organic material. In the whole of the New Agriculture, the eternal law of God and Nature concerning compensation—that you get what you give in this life whether it is in human relations or relations with plants, animals and soils—this law is fundamental.

Strip cropping and contour planting

U. S. D. A. photo

The New Agriculture is built upon terracing and strip cropping, contour plowing and green crops which cover the soil during the long destructive months of the winter rains. It includes the use of commercial fertilizers in quantities sufficient to maintain the balance of lime, phosphorus, potassium, and nitrogen upon which the health and vigor of crops, like the health and vigor of man and beast living upon them, is dependent. It depends upon use of lime and phosphates because through the use of these two elements man can grow legumes like the clovers, vetch and alfalfa which take nitrogen out of the air in large quantities, and pump it into the soil; and out of nitrogen comes the protein which is so necessary to health.

We have reached a point in this great nation where there is no more free virgin land to be had for the taking. We have destroyed by bad farming and erosion a fourth of what God gave us. Another fourth is more than half gone and the rest will not continue to be productive unless most of us farmers change our ways. All this affects every citizen in the nation, city dwellers perhaps most of all, for it is responsible for higher and higher costs of food, and higher and higher taxes—not to mention such things as health, vigor, and intelligence. We might well look at those miserable people sunning themselves in the marble ruins of great cities in North Africa and consider what destruction of the soil can mean to a great nation.

SICK PLANTS RESPOND TO CHEMOTHERAPY

Katherine Palmer Plumb

Condensed from *Flower Grower,* June 1947

WHEN it comes to plant pests, diseases or insects, prevention rather than cure has been the watchword of the gardener for generations. Perusal of late scientific literature suggests that a new era may be just around the corner.

The internal treatment of plants with chemicals to curb diseases—and insects as well—without injuring the patient, is a subject of investigation today in state, national and commercial laboratories. Already a number of disorders traced to nutritional deficiency are remedied by applications of chemicals through foliage, soil or stem. Notable advances in this direction are the cure of internal cork of apples by soil application of boron, the trunk injections of oaks to correct iron deficiency, and foliage or soil treatment with zinc to prevent chlorosis of tung trees.

With indications of success at hand, plant doctors no longer wag their heads tolerantly at the mention of chemotherapy, as this new field of plant science is called. Plants can be saved by internal medication. The problem is to find satisfactory mechanical methods of getting a dose to the place in the plant where it is needed, and to make costs of materials and methods reasonable enough to be practical.

Not a New Idea

Injection of materials into plants or trees for various purposes has been an intriguing subject for a long time. Earliest known records date back to the twelfth century, when men were interested in altering the flavor or perfume, or introducing medicinal qualities into fruits and flowers. Records of such experiments came from many parts of Europe, but there was little actual knowledge of plant physiology or of the pests themselves behind these attempts until the late nineteenth century.

Treatment of Diseases

About ten years ago bleeding canker, a fungus disease of maples and beeches, did considerable damage to shade trees in New England. The fungus itself might not be the direct cause of injury but might be producing a toxin that did the damage. It was found that such toxins could be neutralized by the use of synthetic organic chemicals.*

Wilting symptom of Dutch elm disease

Conn. Agric. Exp. Sta. photo

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* As in other diseases caused by microorganisms, it is the secretion of poisonous materials—called toxins—that enables "germs" to produce disease symptoms.—Ed.

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Photo by Exp. Sta. at Riverside, Calif.

Injection test of a chemical to stop growth of fungus causing Dutch elm disease

Of greater public concern than the maple affliction is the Dutch elm disease, which is a major threat to one of the most highly prized shade trees in the East. Within ten years of its discovery in this country in 1930, Dr. George Zentmyer, then of the Connecticut Agricultural Experiment Station, began working on the possibilities of chemotherapy in connection with this disease. He tested a large number of chemicals in the laboratory and found several with properties that prevented the growth of the disease fungus (*Ceratostomella ulmi*) in cultures. Moreover, he was able to isolate a toxin from the fungus, a solution of which produced the wilting symptoms of Dutch elm disease in elm cuttings as well as in other plants susceptible to wilt.

The next step was to try the inhibiting chemicals on elms. Chemicals were injected through bore-holes in the trunks, through cut ends of terminal branches, through the roots, and through foliage by watering and spraying. He felt that the most practical method of getting distribution throughout a tree was to apply the solution to the soil where it would be taken up readily by the roots and enter the vascular, or water conducting, system of the tree. Unfortunately, one of the symptoms of Dutch elm disease is a clogging up of this vascular system. Especially in advanced cases of disease, this might very well prevent the medicinal dose from reaching the parts of the tree where it was most needed to check the development of the fungus.

Injections were made in young elms both before they were inoculated with the disease-producing fungus and afterward. In a large number of trees treated with oxyquinoline benzoate the appearance of the disease was delayed and the total symptoms were reduced. The chemical appeared to arrest the work of the fungus rather than kill it. Foliage on most of the treated trees remained healthy in contrast with wilting on the untreated, but cultures proved that the fungus was still alive several months later. Young trees up to 12 feet tall were used in these experiments. It remained to be seen whether the medicine would have a similar effect on older trees or would, perhaps, protect those still healthy. With this in mind, elms on the New Haven Green were selected as subjects of the experiment. Last summer solutions of oxyquinoline benzoate were watered on the surface of the soil around trees or were forced down to the roots at 600 pounds pressure. Results are eagerly awaited.

Meanwhile E. M. Stoddard, also of the New Haven Station, had been working on "X" disease of peach ever since its discovery in Connecticut in 1933. This virus disease has now spread from coast to coast but is particularly bad in New York and New England. The fruit and foliage of affected trees drop prematurely and the trees become commercially worthless. The very nature of a virus disease seemed to be an obstacle to the use of chemotherapy. The virus could not be isolated, and so its reaction to chemicals could not be tested in the laboratory. Nevertheless Stoddard tried injections of numerous chemicals in greenhouse-grown trees, both before and after inoculation with the disease. He found the method of cutting off the tops of young trees, and attaching a rubber tube to the cut end and to a reservoir of solution, was the easiest way to make his patients take their medicine.

Experiments in the following years substantiated early findings and narrowed the field of chemicals that brought best results. Most successful was one of the sulfa drugs, p-aminobenzenesulfanilamide which gave 100 per cent control in all experiments in 1943 and 1944. Zinc sulfate, calcium chloride and lauryl isoquinolinium bromide were also very good. Dormant buds immediately start to grow after injection of the sulfa chemical and the new foliage is narrow and chlorotic for six to eight months; adding 2 per cent of maltose or dextrose to the sulfa dose, the injury is reduced and normal growth sets in at an earlier date. The experiments proved that peach trees could be made immune to "X" disease by these injections.

Experiment with oxyquinoline benzoate on soil, for control of Dutch elm disease

Conn. Agric. Exp. Sta. phot

Injections vs. Insects

Two years ago a news magazine came forth with the eye-arresting headline, "Plant Bites Bugs." The report was on the experiments of Dr. William Blauvelt of Cornell University who used minute quantities of deadly selenium in greenhouse soil to check pests of certain flowering plants. The plants took up the poison and were unharmed by it. However, insects feeding on their foliage or buds were destroyed. While selenium is far too dangerous for general use, it is a bonanza to those who raise decorative plants under controlled conditions. Sodium selenate (the particular compound that supplies the selenium) is an extremely poisonous compound which will kill aphids, red spider, chrysanthemum midge, foliar nematode, and many thrips when these pests suck the juices of plants which have been treated.

The Battelle Memorial Institute of Columbus, Ohio, has been successful in controlling aphids on the Snow variety of chrysanthemums with selenium. The use of selenium in soil for African-violets is reported to control pests which stunt the foliage. Sodium selenate may be applied in liquid or in dry mixture at the rate of one-quarter gram per square foot (28 grams = 1 ounce). A stock solution may be made up by dissolving 100 grams of the chemical in one gallon of water. This is used in very dilute form—one quart of stock solution and not less than 50 quarts of water to treat 100 square feet of greenhouse bench. One gram in a gallon of water, applied as a liquid fertilizer, is the usual rate for pot plants. Even distribution is essential, as is timing of application so that the plants will not be injured. Any stock solution should be kept in a glass bottle labeled *POISON*. P-40, the dry proprietary material, contains 2 per cent sodium selenate impregnated on superphosphate. It is broadcast in the same manner as dry fertilizer, 3 pounds to 100 square feet, according to package directions.

In using selenium in any form, warning is given that the chemical is poisonous to man and animals and to certain plants. It may also injure or kill tolerant plants if dosage, timing and distribution are not exact. In no case should applications be made until plants have well established roots in the bench or pot. Also, other insect controls must be used until the selenium has time to become effective, a period ranging from two to six weeks depending upon season and circumstances. The work with selenium is still experimental.

There are other projects in chemotherapy just getting under way, such as the investigations in connection with phloem necrosis, the devastating elm disease in the Middle West, and a serious fungus disease of citrus fruits in California. Whatever its final use, chemotherapy is here to stay and we shall certainly hear more about it in the future.

HOW MUCH 2–4–D TO USE

Follow manufacturers' directions. If 2–4–D does not kill such pestiferous weeds as poison ivy in a few weeks after the first application, try again—this time doubling the concentration. DO NOT use double concentration on lawns, however. Plants growing in shade (poison ivy, etc.) are not easily killed by 2–4–D. Ammate may prove better for such a purpose.

JOIN THE FIGHT AGAINST POISONOUS PLANTS

George S. Avery, Jr.

Condensed from *Flower Grower,* July 1947

THE general public, because it has little knowledge of the problem and no knowledge of its modern solution, still thinks in terms of medical treatment rather than preventive measures when considering remedies for ivy poisoning and hay fever. Both these "diseases" are caused by noxious plants.

The eradication of plants detrimental to man's health is work for people who know plants and how to control them. It is also a problem for community action. In its first phases, at least, it is a concrete job for garden clubs and other civic-minded organizations. As stewards of plant life in their communities, garden clubs have an even greater responsibility here than in gardening for beauty. The problem necessitates that the public be shown how to recognize poison ivy and ragweed, then taught a simple method of destroying them.

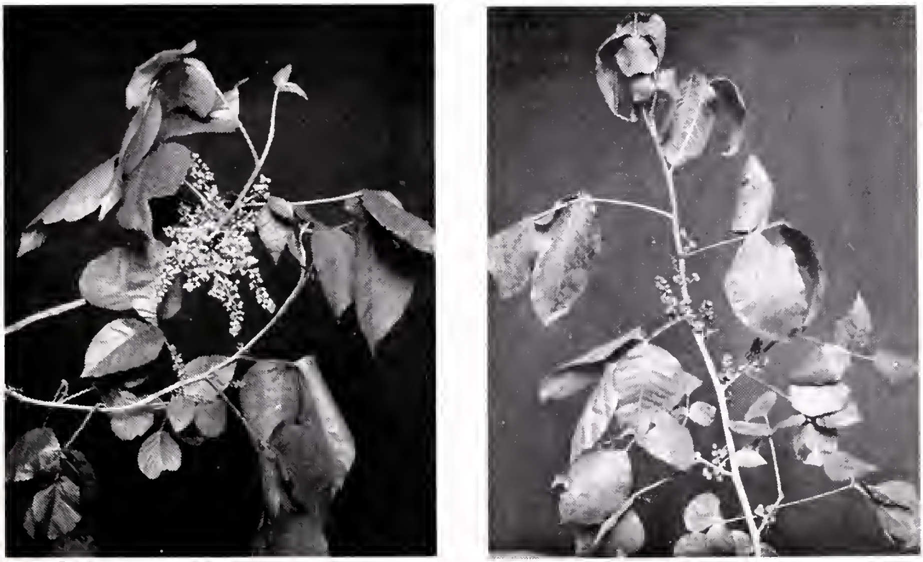
The Diseases

The symptoms of ivy poisoning are well known—irritation and redness of the skin, followed by water blisters and an excruciating itching sensation. The infection ordinarily runs its course in about two weeks, but it can be an agonizing experience. Ivy poisoning is more troublesome than most ordinary diseases. But it is preventable.

Hay fever is on a par with ivy poisoning, but it causes a different kind of discomfort. The sufferer experiences sneezing, congestion and running at the nose,

Poison ivy: at left, in flower; at right, with berries (fruit)

Elsie M. Kittredge photos



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Elsie M. Kittredge photo

Poison sumac in flower

frequently itching and swelling of the eyes, and itching and burning of the roof of the mouth and throat. These may be accompanied by coughing and asthmatic attacks. It is as much a disease as pneumonia, diphtheria or typhoid fever, but it differs in being caused, not by the minute plants which we call germs, but by the minute air-borne pollen grains produced by certain flowering plants. While it is possible for the body to build up immunity to the germ diseases, science so far has provided only an artificial immunity against hay fever and ivy poisoning. This is attained by a series of injections, which are not successful with all people. About 90 per cent of hay fever is caused by two kinds of ragweed—"giant" and "common." A single plant of common ragweed will give off billions of pollen grains during the time it is in flower, and it takes only about 20 grains to induce symptoms of the disease.

New Tools for Eradication

In the past no tool was available for quick and inexpensive control of the offending plants. But researchers have discovered that one of the synthetic plant hormones, a chemical called "2,4-D" (2,4-dichlorophenoxyacetic acid), will, if applied at the right concentration, act as a plant killer. It destroys ragweed at any stage of growth with only one spraying.

A companion herbicide, "Ammate" (ammonium sulfamate), will kill 50 per cent or more poison ivy with a single application; 2,4-D is recommended for poison ivy control, also, but a second spraying is often necessary. Poison ivy growing in the shade—more difficult to control with 2,4-D—requires the use of the newly available ester form of this chemical.

Projects Already Started

Plans for handling weed control programs seem to differ according to the size of the community. At one extreme is the now well-known poison ivy control project in Durham, New Hampshire, a small college town where Mr. and Mrs. James Funkhouser and a few friends have virtually eliminated poison ivy within an area of a one-mile radius from the center of town. The project was sponsored by the local garden club. After three years' spraying with Ammate, it became difficult to find poison ivy to spray.

At the other extreme is the ragweed control project started in metropolitan New York in 1946. An ambitious program mobilized the police, health and park departments, as well as the Brooklyn Botanic Garden, into a full-scale war on ragweed. Policemen were taught to recognize the plants and mapped the vacant lots on their beats where ragweed grew in profusion. These areas were sprayed by the Health Department. The Park Department handled ragweed growing on park property. The Botanic Garden furnished the beginning "know-how" as well as specimens of plants from which policemen and others learned to recognize their enemy. One estimate places the ragweed pollen content of the air over New York City during the autumn season at 100 tons per cubic mile of air! Other ragweed control programs have been reported from such widely separated areas as Muskegon, Michigan; Cincinnati, Ohio; and Rye, New York.

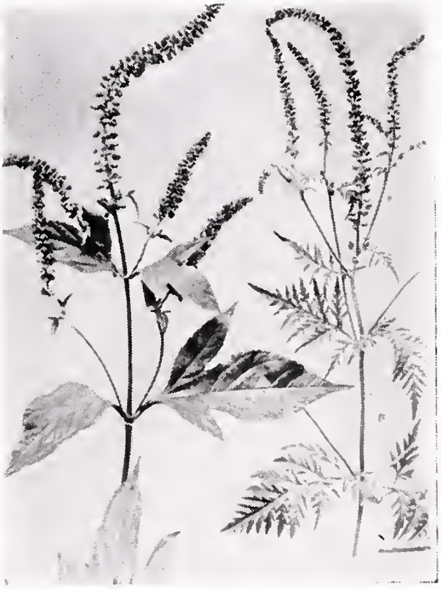
Planning a Campaign

The scope and methods may vary with each community, but here is a plan that can be adapted to city, town or village. To start the campaign rolling, a civic-minded organization ought to get behind the project—a Garden Club, Civic Improvement League, Kiwanis, Rotary or Lion's Club. The originating group can appoint a strong steering committee to arrange for speakers before other service clubs; get the support of the Mayor, Department of Health and City Engineer; contact newspaper editors; ask Boy and Girl Scout officials for cooperation as soon as educational literature is available. Assistance of Farm Bureau and 4-H Club officials can generally be counted upon. Publicity, in the form of newspaper stories, displays in store windows, posters, etc., is a must.

In the actual operation of the campaign, rough working maps of the community should be prepared, showing the infested areas. It is better to have a single spraying operation for both public and private property. Local legislation may be necessary before this can be carried out. Depending upon the size of the community, the campaign may be financed by the originating group, by city funds, or by popular subscription.

The Prospects

Poison ivy can be controlled locally, whether neighboring towns cooperate or not. Not so with ragweed. Its wind-borne pollen travels far. Hay fever cannot be eliminated by ragweed campaigns in a few cities, any more than vaccinating New Yorkers would protect all America against smallpox. But this is no reason to say "Why bother? It can't be done anyway." It can be done! We have virtually freed our country of many contagious diseases by intelligent group action, always utilizing the advances of science. In this project we are not working with the patients, but with the environment. And science has given us new tools with which to work.



The two ragweeds (giant at left, common at right) cause 90 per cent of autumn hay fever.

A copy of the report on the 1947 Conference on the Control of Plants Harmful and Annoying to Man, sponsored jointly by the Brooklyn Botanic Garden and the Department of Health of the City of New York, will be mailed upon request. Address Brooklyn Botanic Garden, Brooklyn 25, N. Y.

THE ECOLOGICAL CONSCIENCE

Community ethics must be aroused to tackle conservation

Aldo Leopold

Condensed from *Bulletin of The Garden Club of America,* September 1947

EVERYONE ought to be dissatisfied with the slow spread of conservation to the land. Our "progress" still consists largely of letterhead pieties and convention oratory. The only progress that counts is that on the actual landscape, and here we are still slipping two steps backward for each forward stride. The usual answer to this dilemma is "more conservation education." My answer is yes by all means, but are we sure that only the *volume* of educational effort needs stepping up? Is something lacking in its *content* as well? I think there is, and I here attempt to define it.

The basic defect is this: we have not asked the citizen to assume any real responsibility. We have told him that if he will vote right, obey the law, join some organizations, and practice what conservation is profitable on his own land, everything will be lovely; the government will do the rest. This formula is too easy to accomplish anything worthwhile. It calls for no effort or sacrifice; no change in our philosophy of values. It entails little that any decent and intelligent person would not have done of his own accord. No important change in human conduct is ever accomplished without an internal change in our intellectual emphases, our loyalties, our affections, and our convictions. The proof that conservation has not yet touched these foundations of conduct lies in the fact that philosophy, ethics and religion have not yet heard of it. I need a short name for what is lacking; I call it the ecological conscience. Ecology is the science of communities, and the ecological conscience is therefore the ethics of community life.

The practice of conservation must spring from a conviction of what is ethically and esthetically right, as well as what is economically expedient. A thing is right only when it tends to preserve the integrity, stability, and beauty of the community. The community includes the soil, waters, fauna, and flora, as well as people.

It cannot be right, in the ecological sense, for a farmer to drain the last marsh, graze the last woods, or slash the last grove in his community, because in doing so he evicts a fauna, a flora, and a landscape whose membership in the community is older than his own and is equally entitled to respect.

It cannot be right, in the ecological sense, for a farmer to channelize his creek or pasture his steep slopes, because in doing so he passes flood trouble to his neighbors below, just as his neighbors above have passed it to him. In cities we do not get rid of nuisances by throwing them across the fence onto the neighbor's lawn, but in water-management we still do just that.

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It cannot be right, in the ecological sense, for the deer hunter to maintain his sport by browsing out the forest, or for the bird-hunter to maintain his by decimating the hawks and owls, or for the fisherman to maintain his by decimating the herons, kingfishers, terns, and otters. Such tactics seek to achieve one kind of conservation by destroying another, and thus they subvert the integrity and stability of the community.

If we grant the premise that an ecological conscience is possible, and needed, then its first tenet must be this: economic provocation is no longer a satisfactory excuse for unsocial land-use (or, to use somewhat stronger words, for ecological atrocities). This, however, is a negative statement. I would rather assert positively that decent land-use should be accorded social rewards proportionate to its social importance. I have no illusions about the speed or accuracy with which an ecological conscience can become functional. It has required 19 centuries to define decent man-to-man conduct and the process is only half done; it may take as long to evolve a code of decency for man-to-land conduct. In such matters we should not worry too much about anything except the direction in which we travel. The direction is clear, and the first step is to *throw your weight around* on matters of right and wrong in land-use. Cease being intimidated by the argument that a right action is impossible because it does not yield maximum profits, or that a wrong action is to be condoned because it pays. That philosophy is dead in human relations, and its funeral in land relations is overdue.

BOTTLE TECHNIQUE WITH 2–4–D

Many are the gardeners who have had a raspberry runner grow in a clump of blueberries, or a seedling box-elder or other weed tree spring up in a spot where it could not be grubbed up without destroying an ornamental planting.

2–4–D has come to the rescue. Fill a pint bottle three-quarters full of 2–4–D solution made up at two or three times the strength recommended by the manufacturer for the usual spray-to-kill procedure. Snip off the tip of the raspberry runner, or other troublesome plant, and insert the cut end into the 2–4–D solution in the bottle—making sure that the bottle is firmly set in the soil so that it will not tip over. The same method works with bindweed ("wild morning-glory").

The advantage? If the woody pests are cut off with clippers, or (often) even if they are pulled out carefully, a fragment of some underground part sprouts and produces a whole new plant. 2–4–D (with the bottle technique) will kill effectively; and such plants can then be snipped off without danger of their coming back.

PARKLETS

Gardens of Eden for those who cannot go to a real park

Dorothy Waugh

Condensed from *Landscape Architecture,* January 1947

PARK department executives, landscape architects, and city planners are very conscious of the importance of large park areas. They work consistently, though sometimes with tragic futility, against the encroachment of zoos, police headquarters, restaurants, paved playgrounds, and other valuable but definitely built areas, upon what has been saved as open space—breathing space, prospect of landscape.

Parks are the chief concern of those who are responsible for our public provisions for accessible open area; but there are other areas of a quite different class which, cumulatively, are very important—more so than is sometimes realized. I mean the small scraps of public outdoor space which, occurring in the midst of built-up areas, give a touch of green, a slight expanse of air, or a place to sit for a moment out of doors, to many persons who could not often get so far as a real park.

In Springfield, Massachusetts, for instance, there is a plain triangle no more than seventy feet or so in its longest dimension, lying between two converging streets. It is not in any way developed. It is just rough lawn with a few

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Historic Bowling Green in lower Manhattan, New York City

Photo Dept. Parks, N. Y. C.

somewhat indiscriminate trees. But the Park Department early each spring places a few benches there, and I have never passed, from early spring to late fall, from early morning to late evening, without seeing a few men from surrounding business areas and a few elderly women from nearby rooming houses taking advantage of their only Garden of Eden.

My attention was first called to this particular spot when a young man in an office where I was working in New York City went to the South Pacific, and his mother left New York to stay with a working daughter in Springfield. The mother, I heard, complained that she didn't like Springfield because she had no place to sit outdoors, as she had had in New York! I realized then that in New York she had lived only a few blocks from Central Park. Until the Park Department in Springfield placed benches in the parklet mentioned, she and other elderly people literally had to sit in their rooms day in and day out, for there was no public bench within their reach.

In Montclair, New Jersey, I have had opportunity to watch the multitudinous use of the little Montclair Library garden—a shrubbery-surrounded lawn only a hundred feet or so square, hemmed in on two sides by the ells of the building.

Women come there to knit. Parents bring the baby in the baby carriage, and two or three older children, on Saturdays. Older sisters and nursemaids blow soap bubbles for children, or read while the youngsters play commando on the grass.

Small boys even pretend to be able to fly kites within the garden's confines. Older boys bring their girls. From offices of the neighborhood at noon, girls bring their lunches on nice days in summer, or they meet there to chat. Older women sit and write letters or read. Employees from a nearby cafeteria who work a split shift are regular occupants of the garden from three to four.

"Our Studio" photo

Parklet in Montclair, New Jersey

These odd little chance parklets scattered over our large towns and small cities are havens which, while comparatively inexpensive to maintain, are highly valuable to just the kinds of people who need them most.

Jackson Square in "Greenwich Village," New York City

Photo Dept. Parks, N. Y. C.

Buckingham ph

DO WE NEED A SHADE TREE SERVICE?

Greatly expanding public interest calls for fast-growing, long-lived, disease-resistant shade trees

Ernst J. Schreiner

Condensed from *American Forests,* July 1947

WHEREVER city or town folk enjoy the shade of a bough, in their own backyard or in the "wilderness" of a park, someone had to preserve or plant those trees many years ago. Of course, large trees can be transplanted, but not at a price within reach of the common man. And vintage trees cannot be moved—not even for princes.

That shade trees are becoming increasingly important in the lives of the American people is an accepted fact. Evidence of this is plainly written in our own yards, in our parks and along our streets and highways. There is hardly a man, woman, or child who has not enjoyed the shade and beauty of trees; and their voices rise in protest when storms, disease, or insects blight shade trees in large numbers.

The earliest settlers undoubtedly saved the best trees around their homes and on their village streets and squares. As the villages and towns grew in size and these original trees were lost through age, disease, or accident, householders and town governments began to plant new ones. In the early days these were dug from adjacent woodlands, but during the past century tree planters have become more and more dependent upon commercial nurserymen. As a result, the urge to plant fast-growing trees or "something different," combined with ignorance of tree requirements, has cluttered many towns and cities with short-lived trees and with natives and exotics thoroughly unsuited to the growing conditions.

Better shade trees are needed. And they can be developed by scientific selection and breeding. We need trees that

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can endure the difficult environment of city streets and parks, trees that are disease resistant, trees that can be grown into shapely specimens on poor sites, trees that will grow rapidly and live for many years. As a rule, fast-growing trees are short-lived, but there is sufficient individual variation to indicate that the breeding of fast-growing, long-lived trees is possible.

Trees such as the ailanthus (the tree that grows in Brooklyn), Asiatic elms, and soft maples, native and exotic, offer excellent possibilities for selection and improvement. The ailanthus has become virtually indigenous, grows under some of the worst environmental conditions conceivable, and persists in spite of excessive abuse even in the dingiest city streets.

The improvement of agricultural and horticultural plants by scientific selection and breeding is common knowledge. In recent years forest tree breeding, still in its infancy, has demonstrated that there are equal and even greater opportunities for the improvement of our forest trees. Tree breeding will serve both the shade tree and forestry fields.

An increasing number of Americans, both urban and rural, are seeking information on planting and care of shade trees. Tree research, left largely in the lap of the forestry profession, has been marred by a serious lack of fundamental research based on trees as individuals. Foresters are primarily "sociologists" interested in the growth and development of trees in stands or communities; as a group they seem to have lost sight of the fact that in the final analysis the success or failure of the forest stand is dependent upon the growth and development of trees as individuals.

There is great and immediate need for extensive collation of existent research findings and for additional but correlated research to guide the home owner, the shade tree nursery-man and specialist, and the city, park and highway forester in the planting and care of *individual* trees. Public interest in shade trees is largely individual and inarticulate; it seldom finds an outlet for unified expression. Nevertheless, education and research directed toward better shade and roadside trees is definitely a public responsibility that should no longer be postponed.

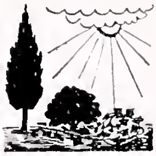
We need a National Shade Tree Service—a clearing house for tree research and practice, and a source of information and education for the general public. Tree research has been going on for many years, in many places, and the published results are very widely scattered. The piling up of observations, facts and figures is merely the starting point of research. There has already been much of this. The time has come to sit down and think. Facts and figures must be sorted, arranged and mentally digested. In this way practice will be served immediately, blind spots will be brought to light, and future research can be more surely oriented. A National Shade Tree Service, with a relatively small but able and energetic staff of tree scientists, could serve as such a clearing house.

Tree research needs are so extensive that it will be extremely difficult, if not impossible, to finance adequately a single research unit large enough to cope with even the most urgent problems. In fact, it is doubtful whether a single large unit could carry on efficiently the widely diversified aspects of shade tree research. Many shade tree research jobs could be handled most efficiently through fellowships assigned to institutions with leaders in specific fields of research.

Cooperative shade tree research might eventually develop even further. Cooperative funds for research by state agencies and at land grant colleges, administered through a National Shade Tree Service, would be in line with established precedents in agriculture and forestry. We need a network of cooperating arboreta covering all regions of our country if we are to provide a substantial proportion of our people with the educational advantages of an arboretum, and proving grounds for new and improved shade trees. The public must be presented with an outdoor museum, not merely a collection of trees and shrubs. Every effort should be made to develop arboretum techniques that will attract and hold the public interest and make exhibits mentally digestible and truly educational. Publications of a popular nature would be a part of this general educational effort.

A second aspect of education merges into the scientific program. There are literally hundreds of individual shade tree men who are being paid by the public for services and advice. A National Shade Tree Service could provide much needed information for these tree men and, in fact, for the whole landscape industry. How best to accomplish this will require considerable study and some "trial balloons." Publications in the twilight zone between the popular article and the scientific paper, short lecture and demonstration courses, and correspondence courses all should be considered.

Do we need a shade tree service? To serve the public interest in trees—the interest of everyone who owns or enjoys shade trees—the answer is obvious.



TO TREE OWNERS:

In the last two years almost one thousand trade-named chemicals have appeared on the market for the control of nearly every insect and disease to which our shade trees, ornamentals, orchards and forests are susceptible. Many of these formulations are extremely toxic to vegetation or animals while some are highly selective in lethal effect. All have been tested in the laboratory and field but inexperienced or careless hands sometimes have given disastrous results.

The situation has been aggravated this past year by unusual outbreaks of destructive pests, due in part to weather conditions favoring them but also to the use of sprays which have killed beneficial parasites and predators. The destructive recurrence of the Japanese beetle, the dangerous increase in red mite and the build-up of oyster-shell scale population would seem to indicate that in our zeal for more and better poisons we are violently disturbing nature's delicate balances.

There is a place for many of the newer insecticides and fungicides but they should be recognized as artificial controls, potentially harmful if not used with care and a knowledge of their selectivity and toxicity. No chemical is a panacea for all ills of woody plants, therefore no spraying should be done without first knowing what is to be controlled and whether the concoction used will do the job.

H. Gleason Mattoon

M. L. Parker photo

A Seattle garden in alpine style

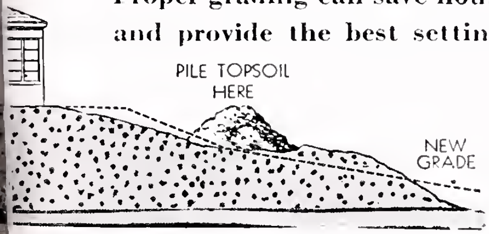
HOW TO GARDEN ON A HILL

Joseph E. Howland

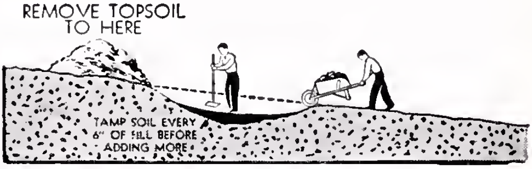
Condensed from *Better Homes & Gardens,* October 1947

Steep hill or gentle slope, your lot can provide the fullness of gardened-home living

Proper grading can save hours of maintenance and provide the best setting for your garden



: fill materials but once. Remove topsoil first and t where grade is already right. Toss or wheel sub- irectly to low spots. Cover with 6 inches of topsoil



Fills can be settled as you make them. Roll or tamp firmly after adding each 6-inch layer. Fills made this way won't slump later. Cover fill with topsoil from pile

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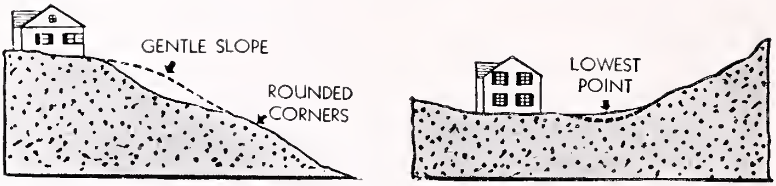
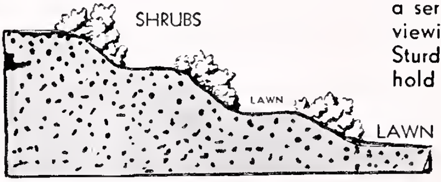
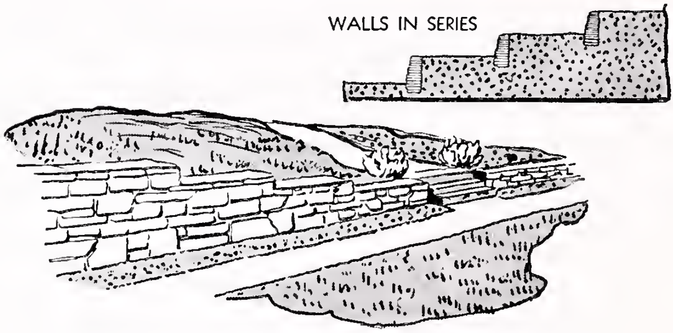


Every house needs a broad, nearly flat area at its base. Otherwise hilltop houses seem ready to slip off their perches and valley sites deluge basements with every rain. Make necessary grade changes before starting to plant anywhere

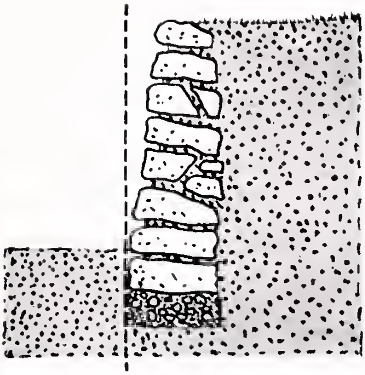


Terraces can convert gentle slopes into a series of walks and level spaces fo viewing choice plants at close range. Sturdy roots of low-growing shrubs will hold soil and hide banks between lawns

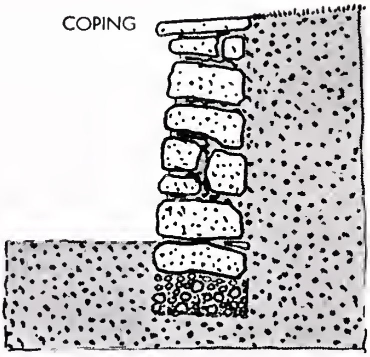


Walls should be low, used in series if necessary. Top line of each wall should parallel others, then step down directly when less height supplies needed support. Keep wall uniform where path crosses

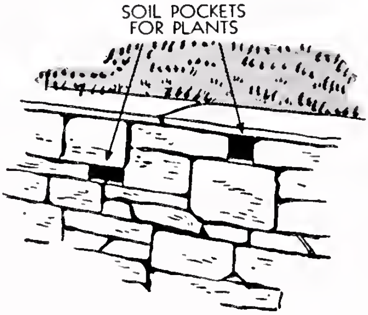
Weathered edges on stones add charm to walls. Inspect your rock supply and remove these treasured stones for protection against danger of chipping. Use them where they'll not be covered by plants



Slope toward fill makes wall appear more stable, exposes stones to face-wash at every rain. Walls must resist powerful force of massed soil. Safety requires base to equal one-third height of wall above lower level

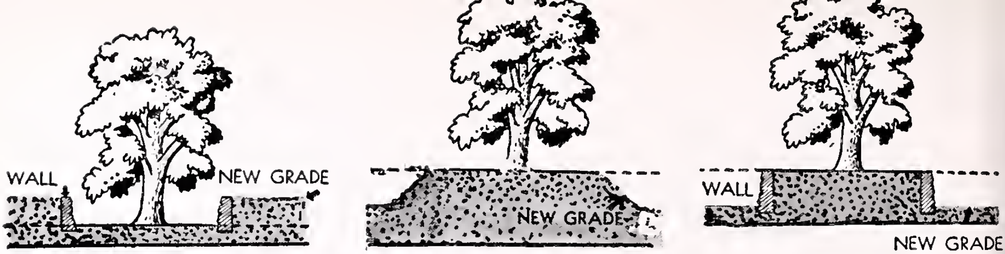


Top of wall must shed water or winter freezes may split rocks and tumble wall. Quick runoff is provided by a coping stone, or by tilting top stone sharply back into fill

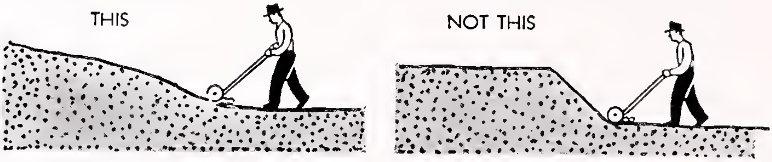


Dry walls require no mortar, provide between-stone growing place for your plants to build deep roots. You can grow showy alpines or any of your favorite dwarf annuals

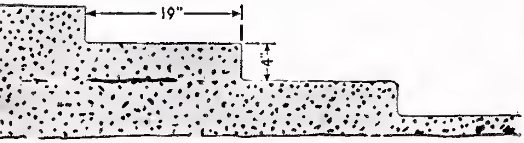
Long, unbroken lines are monotonous. Add a coping (as shown), build bays in your wall, or let trailing vines add an interest

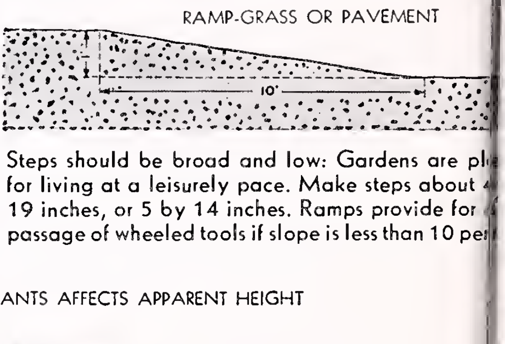


Tree roots die if exposed or burie deeply when new grade is estab- lished. Leave raised bed (above) o build tree well (left) if new grade varie more than 6 inches from old soil leve



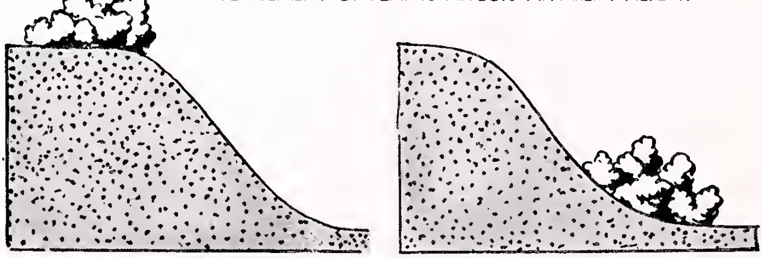
Your lawn won't be scalped with each mowing if you avoid sharp angles where grades change. Slope should be short enough so you can mow it while standing at top of bank. You'll find a lightweight, cogwheeled mower ideal for banks



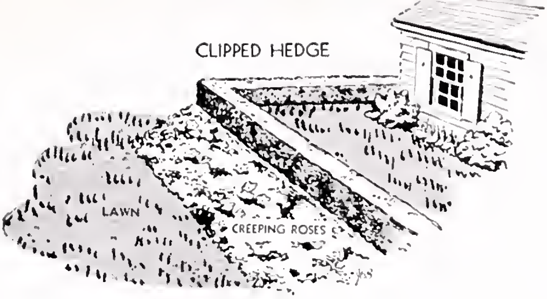


Steps should be broad and low: Gardens are pl for living at a leisurely pace. Make steps about 4 19 inches, or 5 by 14 inches. Ramps provide for passage of wheeled tools if slope is less than 10 pe

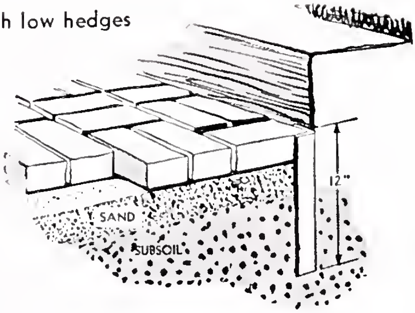
PLACEMENT OF PLANTS AFFECTS APPARENT HEIGHT



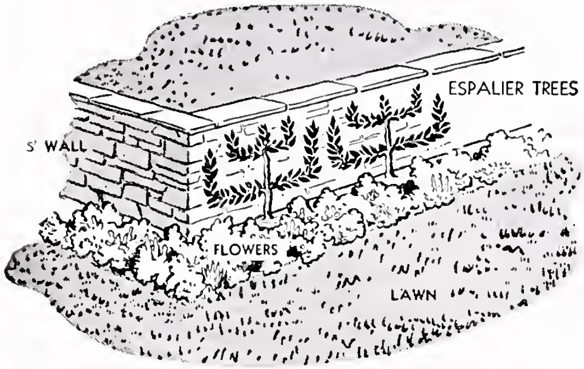
Plants at base of slope reduce apparent steepness; plants at top make slope seem steeper. Careful location of plants can overcome awkward height of house



Terraces above planted banks can be outlined with low hedges



Bricks laid directly on sand will have laid-in-mortar tidiness and won't sprawl downhill if you use foot-deep angle irons to brace corner bricks tightly in place



Flowers and vegetables, also espalier fruit trees, thrive in the protection afforded by walls. Sunlight reflected from stones provides added warmth that stimulates husky growth and abundant blooming early in the season

Banks too steep to mow easily can be planted to groundcovers that need no mowing. Sunny banks: Wichurian trailing rose, spreading junipers, or thyme. Shady banks: periwinkle, pachysandra, or lily-of-the-valley

EVERGREENS
AROUND THE MODERN SMALL HOME

George M. Fisher

Condensed from *Gardeners' Chronicle of America*, October 1947

MODERN landscape design seeks to be in harmony with modern architecture, and the trend toward the "modern" or "contemporary" style of small home architecture is creating decided trends in the use of evergreens in the landscape. The four types of contemporary architecture now in favor for small homes are the Modified Colonial, the Cape Cod Version, the Modern Style house and the Ranch Style. Each architectural style, of course, necessitates a landscape treatment conforming to its own special characteristics, but certain generalities are definitely taking form for the overall landscape scheme.

The modern, low, one-story house is designed for usefulness with simplicity, and the architectural lines are predominately horizontal. Landscape plantings to be in keeping must emphasize the plainness and simplicity of the exterior walls of the modern home.

Houses are being placed just far enough back from streets and drives to provide pleasant and picturesque settings as one approaches the house or views it from the street. This allows the maximum amount of space on the lot for development of the rear grounds into a private and functional outdoor living room area. The front porch of former days is now changed to the rear, and the principal living rooms of the house are likewise oriented to the back, with the kitchen usually found in the front. The result of this transposition is a harmonious relationship between inside and outside living for the family, through the contemporary medium of picture windows, terrace gardens and living room porches leading intimately from the house interior to the outdoor landscape.

Foundation Planting

A carefully executed foundation planting for the modern home will be as important as ever, for the home owner will take pride in the appearance of his house located so close to the street. It will however be more than just a "foundation planting" in accordance with the common usage of this term. Instead of serving to screen the house foundation with heavy masses of too-soon overgrown evergreens, so commonly used in recent years, the foundation planting of the modern home will be definitely a part of the over-all landscape scheme. A harmonious setting for the house will be provided, and continuity of this part of the grounds with the rear yard areas accomplished, by progression of the front evergreen plantings through the side borders and foundations. The planting, which provides a setting for the house, might be called the "entrance development" or "foreground planting."

In general, we probably find fewer evergreens in the front plantings of the modern home than in plantings of the last decade or two. These often overdone, heavy massings of evergreens do not fit the architectural lines of the modern home, as they are greatly out of scale and certainly not in harmony. The right plant in the right place, with an exacting choice of materials which provide beauty, simplicity and year-around interest, will be the keynote for good landscaping of the entrance to the modern home.

Improved forms of dwarf, or low-growing, spreading evergreens will be in order for front plantings, as they best express the horizontal lines of the modern home with year-around appeal. With the wealth of fine adapted varieties of dwarf evergreens now available at nurseries, there is no reason for using

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McFarland photo

An effective planting of yew and juniper

large, rampant-growing types for foundation plantings. Most selected, dwarf varieties are, however, quite slow-growing and somewhat more costly plants to begin with. If some small home owners cannot afford the higher priced matured sizes, they can select smaller sizes, provided these can be given adequate cultural care. It may be possible in some cases to use temporary filler plants to create the desired landscape effect immediately; and later, remove these temporary plants, when the evergreens have developed their full size.

When the modern low type house is properly placed with relation to lawn areas and existing trees, or where framing trees have been strategically located, very little foundation planting may be necessary at all. Where possible, some foundation wall should be left visible and the lawn carried right up to the house.

Suitable Evergreens

A brief list of dwarf and semi-dwarf narrow leaf evergreens recommended for landscaping the modern small home in the eastern part of the country is presented. Each variety, of course, has its own distinct growth habit and site adaptability. The choice varieties of yews will not be given in this list, as these will be presented in subsequent paragraphs.

A select list of low or dwarf evergreen shrubs, varying from one to three feet in height, would include Andorra creeping juniper, globe Eastern red cedar, mugho pine, and dwarf spreading forms of Canada hemlock.

The next group of small-growing types, from three to five feet in height, would include Pfitzer juniper, dwarf Canada hemlock, globose forms of Canada hemlock, and compact erect forms of Eastern and Oriental arbor-vitaes.

Wherever yews (*Taxus*) can be successfully grown, they lend themselves remarkably well to landscape treatment of the small modern home, because of the numerous slow-growing dwarf and semi-dwarf varieties which can be used singly or in quantity to create the desired effect,

W. C. Peck photo

Fast-growing trees are soon out of proportion to the house

also because of their ease in trimming. The yews possess a wide range of color and texture which blend easily in combination with nearly all broad-leaved evergreens and look well against any building background.

Most varieties of yews are healthy under average conditions, and will grow well in either sun or shade and in any exposure. They are heavy feeders and require regular soil attention and fertilization; they are ill adapted to drying winter winds, low summer humidity, sudden fall freezes and late spring frosts.

For creating emphasis along horizontal lines and low massing effect, spreading Japanese yew, dwarf Japanese yew, cushion Japanese yew and intermediate yew would be recommended. For certain localities, it would be well to add the spreading English yew. Suggested varieties of *Taxus* for specimen and accent use are Hicks' yew, pyramidal Japanese yew, Brown's yew and Hatfield yew.

IN A HOME GREENHOUSE

A life-time's experience

T. A. Weston

Condensed from *Horticulture,* March 1, 1947

WHAT few books and articles I have read on the amateur's greenhouse invariably fail to emphasize what I consider should be the major purpose of such a structure; that is, bloom all the year around. Most writers also fail to make clear that the amateur's greenhouse should be a show place.

My first greenhouse experience was as an amateur. My first house and its several enlargements were self-built between the ages of 12 and 18. Thus I knew what I wanted in my present greenhouse. I desired my greenhouse for both utility and show purposes. I knew that to grow all I desired, I would need to hold a temperature of 50–54 when it was zero outside; that meant a boiler and enough piping to ensure safety for 12 to 15 hours without attention.

Except when business has taken me away from home, I have done everything, the watering in winter especially being done in the evening. This is contrary to the rules of greenhouse operations, but the home gardener cannot work by rules. I am away from home five days a week and much work in the greenhouse is done in the evenings. I am firmly convinced that the amateur greenhouse owner, if he wants variety and constant bloom, must grow everything in pots. Even if he does aspire to have

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roses, carnations and chrysanthemums, or even annuals, he should stick to pots. If the house is large, the bench culture system can be combined with pot plants, but where space is limited, I am for pots all the time. With a frame or two as an aid, I do not think there is a day in the year when my greenhouse is entirely without a flower.

I need hardly say that great numbers of pots are in use. The bulbs for spring blooming, of course, are buried during winter, and so plenty of other pots are needed for the winter flowers. All told, I never have less than 500 pots in active use, ranging from one and one-half inch to eight inches, and I am quite sure that at least 100 species and varieties of plants occupy the house during the year.

The house has a three foot, six inch front bench the length of the house except that at the end, where steps lead down to the boiler shed, there is an elevated three by three-foot tray used for seed raising and forcing as it is at the warmest end.

The front bench is wood, covered with an inch of ashes, which are never dry. The back bench is narrow and is in three tiers, although the lowest level goes right to the wall and serves as a resting place for bulbs as they go out of flower, as does the ground beneath, although this latter space also harbors many odd plants during the winter. All seed sowing and potting are done on the rear bench.

View in author's greenhouse

Author photo

There is a 30-gallon water tank in the greenhouse. A watercan with long spout is used for all watering. Only at rare times in early spring is any damping down done; in summer, never, as the greatest bugbear of the greenhouse in summer is humidity. At times the humidity is so great that I refrain from watering for days; the plants seem to get all the moisture they want from the air even when hanging from the roof.

Here are some of the ornamental plants that bloom through the year, starting in November. Many of the items either have been originally raised from seed or are so raised annually. The latter are marked with asterisk.

Double fuchsia

*Streptocarpus, blooming from October to August; nerines, six varieties; lachenalias, 10 varieties; dwarf white callas; *cyclamens; freesias, six sorts; **Primula malacoides*, several sorts; **P. sinensis* in variety; **P. floribunda;* ornithogalums, three sorts; tulips, early and late; hyacinths; daffodils, about 40 pots in variety; *Begonia gracilis;* tuberous begonias, single, double and pendulous; B. Westport Beauty; *B. Scharffi;* *gloxinias; caladiums; orchids, six varieties; bryophyllums; *Schizobasopsis volubilis; Ceropegia woodi; Chlorophytum comosum; Campanula fragilis;* poinsettia; yellow calla, many plants; amaryllis; *Veltheimia viridifolia* and *V. glauca,* and numerous other things, mostly of a bulbous nature, because they are, perhaps, best adapted for use in this way.

Besides these various things which go to make up the show, there are always many seedlings in small pots, sometimes 200 or more; also, numerous four-inch pans containing seedlings and, at times, a flat or two. I have given up cinerarias and calceolarias. They require a much lower temperature. Freesias too would be better off if the house were held below 50 but that cannot be done where there are so many plants that like more heat.

Tuberous begonias are hopeless indoors when the July heat and humidity arrive. Contrariwise, certain hardy subjects are better in the greenhouse all the time, including *Ramonda, Haberlea* and *Primula Littoniana.* In fact, without a greenhouse, it is well nigh useless to try to raise many of the alpines and primula species. In the coldframe, seed may germinate but bugs or other troubles usually decimate them. In many cases, I find it a good plan after seed pans have been frozen in the frame to bring them indoors to induce germination. On the other hand, experience has taught me not to put any pans of choice primulas, etc., into a coldframe until they are of transplanting size.

Author photos

African-violet Amethyst

AFRICAN-VIOLETS HAVE EVERYTHING

Their serene loveliness will justify all your fussing

Ida B. Bates

Condensed from *The Home Garden,*
January 1947

ONCE you get the knack of it, growing African-violets, temperamental though they are, makes a fascinating hobby for the indoor gardener. The plants will repay good care with a wealth of bloom in the middle of winter, when flowers are not so plentiful, and most of the remaining months. Yet they will keep you constantly on the alert. They are not to be trifled with.

You may buy plants from your local florist or from commercial growers or you may start your own from leaves which you beg from some friend. There are many good named varieties.

Propagation

Plants can be propagated quite easily from the leaves by one of several methods: in coarse sand, in water, or in a terrarium. If you choose sand, which is the medium most generally approved, fill a container (presumably a flower pot) with coarse builders' sand, moisten it thoroughly, place mature, healthy leaves in this almost up to the base of the leaf and set the container in a warm,

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Part of the author's collection of African-violets

light place. A jelly glass inverted over the pot facilitates rooting by providing constant humidity. An east window is a good location for the cuttings as they get just enough sun and no more. Keep the sand moist at all times. After some weeks tiny new leaves will appear, and soon you have a plant ready to take out and place in a pot of soil. March is the month when leaves may best be propagated for quick results, but they can also be rooted—though more slowly—at other times of the year.

For rooting in water, an ordinary water glass is all right. Take a piece of waxed paper, slit several holes in it and place over the top of the glass, which has been filled with water. Through these holes insert the stems of the leaves so that they are immersed; place the glass in a warm light place; and see that the water is always kept high enough to reach the stems, until roots are formed. The water method is not so satisfactory as rooting in sand or in a terrarium.

To root leaves in a terrarium, first place bits of charcoal in the bottom of the container, then coarse sand, and finally a layer of soil. Dampen this (not too wet); place your leaf stems in the soil, using the same method as in sand; cover the bowl or jar with a piece of glass, and place in a warm, light location. Lift the lid to let in fresh air for an hour or so each day. Should the soil become too wet, leave the lid off for a longer period. This last method requires less checking than the sand box as it creates its own moisture and humidity.

Potting the Rooted Cuttings

When the tiny plants are large enough to come out of the propagating vessel, place bits of broken pots, china or pebbles in the bottom of pots, for proper drainage; add soil; set the plants; firm soil carefully around the roots; then place the pots in pans of water until the surface soil becomes thoroughly moist. African-violets like a loose porous soil that holds moisture but does not become soggy. A standard potting mixture consisting of ⅓ garden loam, ⅓ sand, and ⅓ leafmold or peatmoss is satisfactory.

Growing Conditions

Place the newly potted plants in a light window. Morning sun will not hurt them and helps make stronger plants, but too much sun will kill them. An east window, if the eaves are wide, is fine, though a north window suits well-grown mature plants better. Do not let the tips of the leaves touch the panes or sash in winter as they may thus become chilled.

The young plants will, in a short time, form 2, 3, or even 4 rosettes of leaves each. If this occurs, plants should be carefully knocked out of the pot and the rosettes cleanly divided, each with a good clump of roots. Pot separately in roomy pots. They will grow fast and since repotting sets them back, it is best to give them room to grow. Unlike many flowering plants, African-violets need not be pot-bound to bloom profusely. If the rosettes are not divided while young, the leaves will crowd each other so that bloom will be retarded. Plants thrive from 60 degrees (the temperature at which they are commercially grown in greenhouses) to 70 degrees, which they tolerate in the home if they do not have too much sun and are provided with plenty of humidity. An even temperature suits them best.

How to Water

Watering from the bottom is the best way. The water then reaches the roots first and will not cause the soil to pack as pouring water in from the top may do. Bottom watering prevents the possibility of wetting the crowns of the plants or the leaves, which causes spotting and decay. If the soil on the surface of the pot is kept somewhat dry, it prevents the lower leaves from getting too much moisture, which may cause rotting. Should water be accidentally dropped on the leaves, wipe off carefully and keep away from sun until entirely dry. Never use water colder than the air of the room, as African-violets dislike sudden changes of temperature.

Plants may be fed small amounts of plant food or manure water, but use it sparingly or the plants may be killed. If the blooms are kept clipped off, as they fade, plants will bloom much longer.

Varieties

African-violets come from tropical Africa where they thrive in forests near waterfalls which provide them with cool shade and plentiful moisture. Many varieties have been developed though not many different colors. The blues appear to predominate, the principal difference being in the foliage. Blue Boy, Blue Girl, Curly Special, and Mentor Boy are all lovely blues, the foliage varying considerably in each. The species, *Saintpaulia ionantha*, is a fine pale blue, and while it does not bloom as profusely as the above-named varieties, is well worth growing because of the way its foliage grows up instead of out.

Pink Beauty and Pink Lady are both beautiful pinks of about the same shade, with a slight difference in foliage. White Lady has glistening pure white flowers with light, clear green foliage. Amethyst is a profuse bloomer with red-stemmed pointed leaves and pale amethyst-blue flowers. Red-bicolor blooms well and is a beauty, while Red Head is a fine shade of almost plum red.

African-violets: Pink Lady at left, Blue Boy at right

WHAT TO DO WHEN YOUR PLANT ORDER COMES

Whether or not you can plant at once, immediate attention is required

F. F. Rockwell

Condensed from *The Home Garden*,
April 1947

YOU expected them Friday, and here they arrive on Monday just as you are starting for the office. Or it's raining, and it's just impossible to plant. What to do in the meantime?

At once open packing box (1 and 2) and remove plants. If they have been long in transit, or packed in tight cartons, some of them may have begun to heat, or even decay. Free circulation of air is first aid. Spread plants out for examination, but keep all bare roots covered with moist peat or sphagnum. If small plants can be set out at once, place in a flat or box (3) and keep roots or packages covered while doing the job.

The Plants and Treatments Differ

On unwrapping the perennials, you will find marked differences in their habits of growth, and the way they have been packed. Some with fleshy roots or rhizomes and masses of fibrous feeding roots, such as the daylily (4), will stand considerable abuse. Others are actively growing plants in pots, such as the gaillardia (5). They've been transferred for shipment from the clay pots, in which they grew, to paper ones. These should be planted as soon as possible, lest the tender new root growth on the surface of the pot-ball be injured. Large "field-grown" clumps of such vigorous customers as tritoma (6) can be planted as received, or separated into smaller divisions, each of which will develop into a comparable plant by next season.

Still another type is represented by dianthus (7), creeping phlox (*P. subulata*) and many of the rock plants. These have comparatively small root systems and quickly dry out. Best treatment, if they must be held for some time, is to trim them back, pot in good soil and peat moss (8), plunge pots in ground to rims, and keep shaded for a week or so. New root balls will quickly form. Final transplanting can follow later.

From Repacking to Heeling In

If, because of lack of time, or of inclement weather, no planting can be done, how can they best be held? The old gardener's trick of "heeling in" comes into play. This is temporary planting, with the plants placed close together, but far enough apart to permit free air circulation around their tops.

The simplest form of heeling is really re-packing. Set the plants upright in a

Richard Averill Smith photos

1

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fairly deep box, packing damp sphagnum or peatmoss around the roots as they are put in (9). Most plants so placed, and kept in a light place, with care that they may not dry out, will keep in perfect condition for as much as two or three weeks, even if some top growth and root growth occurs. Or the plants may be set in well pulverized soil in a frame, or even in the open (preferably in semi-shade) with the earth packed firmly about them (10).

Fruit trees, shrubs, roses shipped with bare roots may be treated in the same way. The roots are placed in a trench six inches or so deep, the tops being slanted at an angle of 45° or so (see 14). If the tops have begun to shrivel, bury them (11) for a week or two, until the wood again "plumps up." Roots are, of course, kept moist.

Roses Have Their Special Needs

Despite the often very definite advantages of planting roses in the fall, many gardeners, for one reason or another, still set them out in the spring. Care in doing the job properly, and just as early as possible, will increase the chances of success with them.

Though many nurseries now ship rose bushes pruned back to about one-third their original length, there is still work for the gardener to do. A well grown, 2-year field grown rose is shown (12) as received from the nursery. All very

2 above; 3 below

4 at left; 5 at right

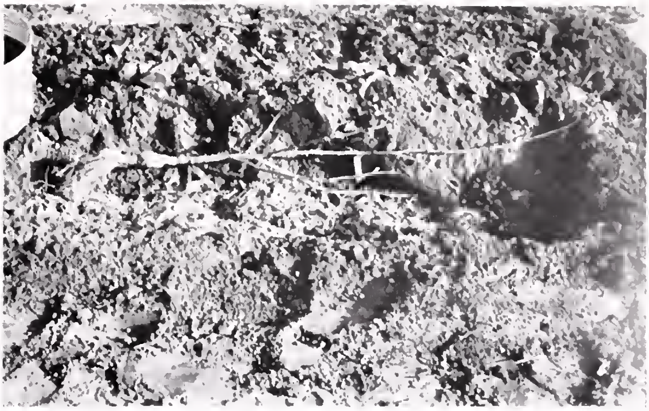
6

7

8

9

10



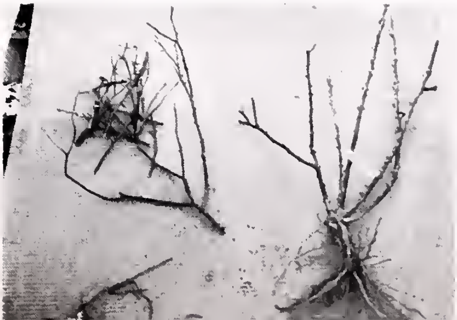
11

weak or mechanically injured shoots are cut out, back to the base of the plant or to stubs with only 2 or 3 eyes remaining. Then the roots are checked over—the longest ones trimmed back, the injured ones cut back to sound wood. The result is a plant similar to that shown (13). Now it is ready for planting or for heeling in (14). The advantage of pruning back before heeling in is that there will be less bark surface to evaporate moisture taken up by the reduced and disturbed root system.

In either planting or heeling in it is important to mound the soil up well around the canes, covering the lower

12

13



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eyes; also to mix peatmoss with the soil filled into the planting hole. These precautions will help to reduce evaporation and maintain steady moisture.

Climbing roses are in a different class. Many of the newer varieties flower on old wood, and in planting some of the older growth should be preserved. With these it is especially important that the canes be prevented from drying out before planting, and that the soil about the roots be kept moist during the first season.

Shrubs Need Advance Pruning

Shrubs should be given the same treatment, in general, as roses. The plants are likely to be larger, if not older, than rose bushes, and considerably more of the top growth can with advantage be cut away.

First to come out (after any broken or injured branches) are the remains of old canes at the center of the plant (15). Cut these back to the base. Shrubs usually are not pruned back when shipped—the theory being that the customer will think he is getting more for his money. That may be good psychology on the part of the seller, but the general run of shrubs—such as forsythia, weigela, deutzia, buddleia, beautybush, kerria—will make much more shapely specimens if they are pruned back quite severely before planting (16). Privet and barberry, the two most popular hedge plants, should be cut back drastically. This is best done after planting, leaving shoots only 6 to 10 inches long in the case of privet, and two or three times that much for barberry (depending upon size and condition).

As a rule shrubs are dug rather carelessly and there are likely to be many broken or injured roots. It is well to cut these back to sound growth, and to trim back long roots that would be troublesome in planting (17). If there must be delay in planting, heel in after pruning and trimming.

Small trees, as distinct from the bushy type of shrub, should be cut back only moderately, removing broken and misplaced branches. This applies to lilac, laburnum, chaste-tree, dogwoods and the like. The broadleaved evergreens usually need no pruning.

16

17

STRAINS OF AMERICAN HOLLY

One of our most beautiful trees

H. Gleason Mattoon

Of all our native trees, none is more beautiful than American holly (*Ilex opaca*). It has charm and distinction at every season of the year. The bright, delicate green of the young foliage in spring is in striking contrast with the rich, dark green of the older leaves. Even the tiny cream-white blossoms in May have a delicate beauty. But at no other season is holly so definitely the aristocrat of the garden as in the fall when the rich green foliage is interspersed with a profusion of red berries. Those less appreciative of nature's beauties cannot but admire a snow-flecked holly that is host to cardinals feasting on the fruit.

Though it is frequently used as a multiple-stemmed large shrub in ornamental plantings, when growing naturally holly becomes a tree fifty or more feet in height with a trunk diameter of as much as thirty-five inches. Within its natural range from Massachusetts to Florida and west to Texas, it appears as an understory tree in moist woodlands; and as the result of seed dispersal by birds and animals, along fence rows and in abandoned fields. Occasionally it is found in pure stands.

It is normally dioecious (staminate and pistillate flowers borne on separate plants), although a polygamous specimen is infrequently found. The pollen-bearing (staminate) flowers appear

A 45-foot specimen of "Brooks" holly

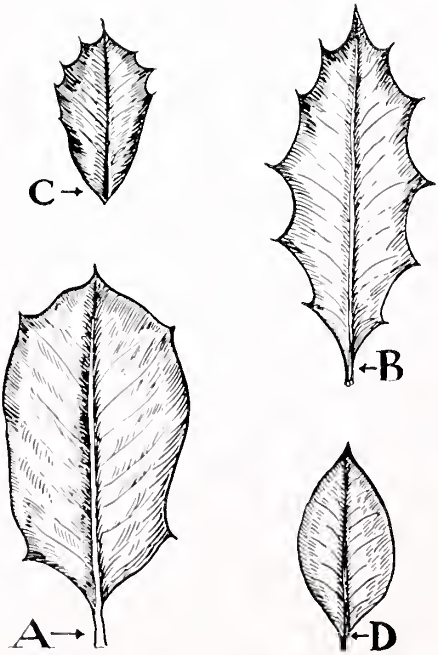
Author photo

usually in three's on a short stem while the seed-bearing (pistillate) blossom is normally solitary. The berrylike fruit ranges in color from yellow through orange to red with shades of red predominating. In size and shape the berries vary greatly. Most berries are round, some ovate to oval, and vary from ⅛ to ½ inch in diameter.

Two varieties of *Ilex opaca* are recognized by Alfred Rehder, "subintegra" and "xanthocarpa," the latter with yellow fruit. In addition, over one hundred named strains have been propagated by nurserymen and others. These are clones from trees that appear to be outstanding. While some of these selections have sufficiently distinctive characteristics to merit varietal designation, a few, at least, do not maintain their distinguishing attributes under varied growing conditions. It is perhaps unfortunate that so many have been named before being subjected to numerous trials, for it has resulted in a profusion and confusion of names.

Typical leaves of wild holly showing the great diversity of size and form

Drawn from author's photos



Holly Varieties

A few of the named strains which have had wide distribution and are generally known will be mentioned. Many catalogues carry Hume No. 1, Hume No. 2 and Howard. These are selections of Professor H. Harold Hume, Dean of the School of Agriculture, University of Florida, who states that they are varieties of *Ilex opaca*. Others have suggested, because of the thinness of the leaf and the texture of the fruit, that they are natural crosses between *Ilex opaca* and *Ilex cassine*. Whatever their parentage, all three are characterized by delicate leaves having but few small spines and a profusion of small bright red berries. In my own test plot, Hume No. 2 has withstood Pennsylvania climate while Howard appears tender.

Dr. Hume has also introduced East Palatka, Lake City, and Taber No. 3, all of which appear in several catalogues and are found in collections. Since they all originated in the South, there is some question about their hardiness, although Lake City and Taber No. 3 have withstood several Pennsylvania winters. East Palatka has died back.

Croonenberg, named by S. H. Thrasher, is characterized by its compact, upright growth, foliage of large size, deep color and sparseness of spines, and scarlet berries of large size. In some site and soil conditions, it is not an attractive plant, while elsewhere it is a superb tree particularly suited for use as a specimen.

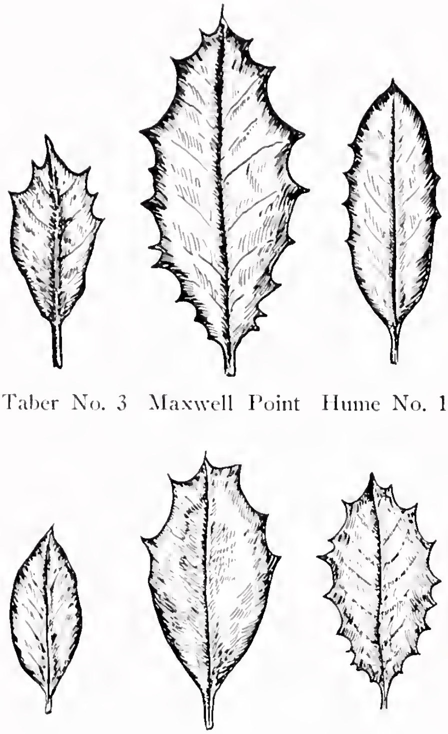
Near French Creek, West Virginia, at an elevation of 1,700 feet, there is a holly tree of unusual size and beauty. The several trunks are all large; one measures 4 feet 3 inches in diameter, another 3 feet 1 inch. The tree is now 45 feet in height even though 20 feet of the top were cut off by vandals a few years ago. Because of its beauty and ability to bear a heavy crop of large berries each year, the tree has been admired for over 60 years by the family of Professor Maurice G. Brooks of the University of West Virginia. Cuttings have been taken from the tree by representatives of the University and by Professor F. L. O'Rourke. This clonal strain, named the Brooks, has sturdy twigs, large, thick, glossy green leaves, and fruit nearly ½ inch in diameter. It will likely merit continued propagation.

The Reynolds holly was discovered by J. C. Reynolds, State Horticulturist, Nashville, Tennessee. The berry, of a bright red color, is about ½ inch in diameter. So far as I know, this strain has not been tested in the North.

One of the most industrious American holly enthusiasts is Dr. W. C. Frierson of Westminster, South Carolina, who has searched the countryside for outstanding fruit-bearing trees. Of the thousands seen, he has propagated twenty which, in his estimation, are superior. Others are still under test. Most of the trees are located in the Carolinas and neighboring states, some at elevations that would make the climatic conditions not unlike the more northerly range of American holly.

Of them all, Dr. Frierson considers Jesse Younce the finest. The parent tree stands some distance from Walhalla, South Carolina, at an elevation of 1,100 feet. It is fastigiate, 47 feet in height with a trunk diameter of over 2 feet and bears annually a profusion of scarlet berries of medium size. Unlike many wild hollies, the lower branches are as heavily berried as is the top. The foliage, of medium size, has good color and more gloss than many.

Another favorite of Frierson's is the Lombard, named in honor of its owner, Eric G. Lombard of Horse Hole, North Carolina (altitude 3,100 feet). It is now 20 feet in height. The most noticeable feature is the annual crop of red berries that literally bends the branches.



Taber No. 3 Maxwell Point Hume No. 1

Howard Hibernia Miss Helen

Named strains, showing leaf distinctions

The largest tree selected by Dr. Frierson is the Lambert, which stands near Lenoir, North Carolina. At 18 inches above ground, the trunk is 108 inches in circumference, while the tree is 47 feet in height. It is known far and wide for its berries which make it look like a "red tree from a mile away." One small branch never bears fruit. Because this branch starts from a decayed area in a larger limb, the theory has been advanced that a seed germinated in the wound and developed into a staminate tree which through the years has grafted itself to the larger limb.

One does not mention holly without bringing to mind Miss Elizabeth C. White of Whitesbog, New Jersey, who has done so much to bring better strains of *Ilex opaca* to public attention. Of the numerous named clones propagated by her, many have been discarded as inferior while several are among the choicest grown today. Miss White says that names were given them because they were easier to remember than numbers. Some names have a queer origin, for instance Farage, which is a contraction of Left Garage, a notation on the labels of one set of rooted cuttings. The original tree was moved from New Lisbon, New Jersey, to the left of the garage on the White property, hence the notation on the label. Farage is a superior type of New Jersey holly with fine dark green leaves, producing an annual crop of bright red berries.

Griscom, possibly the choicest of the White selections, is noted for the gloss of the leaves and the size and brilliance of its oval berries. The parent tree, which stands near Woodbury, New Jersey, and is 54 feet in height with a trunk circumference of 5 feet 3 inches, is estimated to be 250 years old.

During the early years of Miss White's enthusiasm for American holly, Thomas Windon, her employee, sought out and took cuttings from the finest trees in the holly belt of New Jersey. Among them were two that have withstood the test of time and varieties of soil. One of the earliest to be named was Mae, which is a slender, well-shaped variety of better than average foliage. Its profuse crop of berries are an attractive crimson. Manig also comes from New Jersey parentage. The leaves are large, dark glossy green, while the berries are unusually large. On the parent tree, many of the fruits are borne three to a stem.

Another holly hobbyist of unbridled enthusiasm is Earle Dilatush, who will tell you of the particular merits of Old Heavy Bearer (Hookstraw) at the first opportunity. The mother tree bears a heavy crop of berries on short, sturdy limbs. It is a beautiful conical illustration of the best in American holly. Bountiful, another Dilatush product, is a tree of slender graceful branches which are so pendulous that some of them have self-layered.

On Cape Cod, Wilfrid Wheeler has been diligent and successful in his quest for outstanding specimens. Of all his selections, I like Emily best. Unfortunately, the original tree which stood in West Barnstable, Massachusetts, was destroyed during military manoeuvers. These clones are noted for large fruit of deep scarlet and a very fine leaf. Natale, also from West Barnstable, is outstanding for the manner in which the berries are set. Clusters of large fruit appear on the upper part of the new growth so that few are hidden by the leaves. The name Natale is Latin for Christmas or Natal Day. St. Mary, from the Island of St. Mary, is a compact tree with small glossy foliage and medium-sized bright red berries. It is one of the best to grow for sprays for Christmas.

Maxwell Point was named for the location of the original tree, discovered by Henry J. Hohman of Kingsville, Maryland. The leaves are large with pronounced spines, as may be seen in the illustration. Miss Helen, a rather recent selection of G. H. McLean, Towsen, Maryland, is an upright grower which produces a large crop of red berries when quite young.

Of the yellow-berried strains, the finest I have seen is Fallow, introduced by Jackson M. Bachelor. The parent tree stands on the Fallow farm, Batesburg, South Carolina. The leaves, 2 inches or more in width and 4 inches in length, are glossy and dark, while the fruit is bright clear yellow. Another yellow-fruited variety is Marion, introduced by Dr. Hume, which has excellent foliage and bright fruit. Among those with orange berries is Vora Woods, propagated by Frierson. The original tree grows near Mt. Lookout, West Virginia, at an elevation of 2,000 feet. The berries of medium size are usually borne in profusion.

The parent tree from which the variety

Joe Stephens came seems to refute the theory that American holly will not grow well except in an acid soil. This tree is thriving on a limestone ridge in a fence row on a farm in southwestern Virginia. The fields on both sides of the tree are limed regularly, yet the leaves, of medium size, are of good color. The heavy annual crop of scarlet berries, ovate in shape, are borne in clusters. Nothing about the tree, which is 27 feet in height with a trunk diameter of 18 inches, would indicate anything but ideal soil conditions.

It is possible that many of those mentioned will stand the test of years, but they will meet persistent and increasing competition. The quest for unusual and distinctive trees is going on at a feverish rate. At the same time, American holly is finding a larger place in design. Landscape architects and nurserymen are beginning to recognize its many uses. They have discovered also that this lovely native tree can withstand greater extremes of temperature and moisture than hitherto believed. It is being grown in Maine, New Hampshire, and New York, and in the plateau area of Pennsylvania where 30 degrees below zero is not unknown.

Moreover, controlled hybridizing is being started. Our desire for the exotic and unique in plant material has caused us to overlook some of the choicest native species, among which is American holly. Now that it has been "discovered" we may look for increasing numbers of choice selections and fine seedlings from controlled pollination.

2–4–D PATENTS

Long-pending patent litigation regarding 2–4–D weed killers has been settled. Of interest to the general public is the granting of the free right to make and use 2–4–D weed-killer preparations. If made according to the compositions claimed in the original patents, the preparations may not be sold without a license from the owner of the patent. However, formulations falling outside the scope of the original patents may be sold without license.

Distributors, retailers, or any resellers require no license when the produce they are offering is secured from a licensed manufacturer. All important manufacturers are properly licensed.

WORTH READING

A SELECTED LIST OF RECENT NON-TECHNICAL BOOKS, MAGAZINE ARTICLES, AND EXPERIMENT STATION BULLETINS FROM ALL SECTIONS OF THE COUNTRY

General

GARDENING, A COMPLETE GUIDE TO GARDEN MAKING, by Montague Free. Published by Harcourt, Brace and Co. and The American Garden Guild, Inc., New York, 1947. 550 pages. $4.

A revision of this popular book, especially bringing the chapters on garden enemies up to date and modernizing the lists of varieties of plants.

WOMAN'S HOME COMPANION GARDEN BOOK, edited by John C. Wister. Published by P. F. Collier and Sons Corp., N. Y., 1947. 1024 pages. $6.

A practical garden book for beginners as well as experienced amateurs in every section of United States and Canada. Illustrated with color and line drawings.

THE LAZY GARDENER, by William Clayton Pryor. Published by Longmans, Green & Co., N. Y., 1947. 221 pages. $3.

Amusingly written, it really is a book on gardening throughout the year and suggests the short cuts that will help to make the garden successful.

YOUR CALIFORNIA GARDEN AND MINE, by Sydney B. Mitchell. Published by M. Barrows & Co., N. Y., 1947. 261 pages. $3.

For Californians this book, containing garden experiences of thirty years, holds a wealth of factual material and has great value in its enthusiasm.

YOUR BOOK OF GARDEN PLANS, by Norman A. Morris. Published by Murray & Gee, Culver City, Calif., 1947. 95 pages. $3.50, paper bound $1.50.

Sketches to aid the California home owner who wishes to be his own landscape architect.

ARBORETUMS AND BOTANICAL GARDENS OF NORTH AMERICA, by Donald Wyman. Published by Chronica Botanica Co., Waltham, Mass., 1947. 103 pages. $1.50.

A complete and authoritative directory of arboretums and botanical gardens of North America. Illustrations, notes, and lists of gardens featuring special plants.

THE WORLD GROWS ROUND MY DOOR, by David Fairchild. Published by Charles Scribner's Sons, N. Y., 1947. 347 pages. $5.

Gleanings from the author's travels in search of new plants that could grow in America, and the story of his Florida garden, with many of his own photographs. Chapters on "Sharpening the Senses," "The Great Freeze," "Some Nesting Habits of Humans," "Higher Levels of Existence," etc.

OUR FLOWERING WORLD, by Rutherford Platt. Published by Dodd, Mead & Co., N. Y., 1947. $6.

An unusual story of plant life from the coal age to the present. Richly illustrated with the author's own photographs, in color and in black and white. Chapters on "Life's Greatest Invention," the drifting of continents, "Vertical Magic," "Shall Weeds Inherit the Earth?", etc.

AMERICAN HORTICULTURE NEEDS TO ADOPT UNIFORM COLOR STANDARDS, by Donald Wyman. In *Arnoldia*, Sept., 1947. 12 pages.

This article points out the need of an accurate standard for describing color, and notes the lack of uniformity in description by various authors.

SHADE AND COMMON SENSE, by Montague Free. In *The Home Garden,* Sept., 1947. 4 pages.

A plea for thoughtful selection of plants for shady locations and proper preparation for their planting.

THE GARDEN CALENDAR FOR 1948, by Helen Van Pelt Wilson. Published by M. Barrows & Co., Inc., New York, 1947. 121 pages. $1.

An engagement calendar, with a garden picture for each week.

EXPLORING FOR USEFUL PLANTS, by David Fairchild. In the *Journal of the New York Botanical Garden,* March, 1947. 8 pages.

A story of the value of plant exploration in terms of new commercial crops and the need for continued effort to bring others into commerce.

ARIZONA HIGHWAYS, Jan., 1947. Published by Arizona Highway Department, Phoenix, Arizona.

This issue has many striking color plates of cacti in bloom, and several articles on cacti and other desert plants.

THE WORLD IN YOUR GARDEN, by W. H. Camp. In *The National Geographic Magazine,* July, 1947. 65 pages.

A story on how plants from all parts of the world have come into gardens. Colored illustrations.

Soils and Fertilizers

THE SOIL LOOKS TO A GOOD STEWARD, by R. H. Engle. In *The Rural New Yorker,* Feb. 1, 1947. 1 page.

A discussion of the make-up of soil, and what gardeners may do to improve or change it.

COMPOSTS, MANURES AND INORGANIC FERTILIZERS, by Walter Thomas. In the *Journal of the New York Botanical Garden,* Sept. and Oct., 1947. 11 pages.

An article on the make-up of the soil, the needs of plants and the use of fertilizers.

ON GARDEN FERTILIZERS, by V. A. Tiedjens. In *Horticulture,* April 15, 1947. 1 page.

A discussion of the various kinds of fertilizers, and their selection and use in gardens.

TOBACCO ASH IS GOOD FOR PLANTS, by A. E. Murneek. In *Flower Grower,* Jan., 1947. 2 pages.

Tobacco ashes are good fertilizer for house plants because of their high content of potash, calcium and other elements.

PROGRESS IN SOIL SCIENCE, by F. L. Duley. In *American Scientist,* Oct., 1946. 10 pages.

A review of man's care of and dependence on the soil, both individually and as a civilization, from ancient times to the present. Research and present day soil practices are discussed.

ORGANIC MATTER IN FLORIDA SOILS, by L. G. Thompson, Jr., and F. B. Smith. University of Florida (Gainesville) Agricultural Experiment Station Bulletin 433, July, 1947. 15 pages.

A bulletin on the importance of organic matter in soils, with suggestions on how it may be maintained.

Plant Pests and their Control

JAPANESE BEETLE—LIFE HISTORY AND CONTROL, by John C. Schread. Connecticut Agricultural Experiment Station (New Haven) Bulletin 505, May, 1947. 20 pages.

This bulletin brings information up to date in both the biological and the chemical control of the Japanese beetle.

A NEW RIVAL FOR DDT—HEXAETHYL TETRAPHOSPHATE, by David G. Hall. In *Flower Grower,* April, 1947. 2 pages.

An article on this new insecticide and its use on ornamental plants, with a list of the pests it controls, including red spider.

NEW WEAPONS AGAINST INSECT PESTS IN 1947, by Amanda Quackenbush. In *Horticulture,* June, 1947. 2 pages.

New forms of DDT, rhothane, chlorodane and certain phosphate compounds are promising insecticides for garden use.

THE BIOLOGY OF THE MAPLE LEAF SCALE, by W. J. Baerg. University of Arkansas (Fayetteville) Agricultural Experiment Station Bulletin 470, June, 1947. 14 pages.

A well illustrated bulletin on biological studies of the maple leaf scale.

CONTROL OF GLADIOLUS THRIPS AND OTHER INSECTS IN STORAGE, by A. A. Granovsky. In *Minnesota Horticulturist,* Oct., 1947. 3 pages.

This article tells how properly to treat and store gladiolus corms.

HELP SAVE YOUR ELMS, by Joseph E. Howland. In *Better Homes and Gardens,* June, 1947. 2 pages.

Suggestions for care of elms, and how to recognize the Dutch elm disease and phloem necrosis.

DISEASES OF ORNAMENTAL PLANTS, by Junius L. Forsberg. Published by Colorado Agricultural and Mechanical College, Fort Collins, 1947. 172 pages. $.50.

A manual containing descriptions, illustrations and control measures of diseases of flowering and other ornamental plants. It is written for the use of florist, nurseryman and gardener.

DUTCH ELM DISEASE AND ITS CHEMOTHERAPY, by George A. Zentmyer, James G. Horsfall, and Philip P. Wallace. Connecticut Agricultural Experiment Station (New Haven) Bulletin 498, July, 1946. 70 pages.

A report of biological and pathological investigations concerning Dutch elm disease, including progress in prevention and control of the disease by the use of organic chemicals applied internally.

THE X DISEASE OF PEACH AND ITS CHEMOTHERAPY, by Ernest M. Stoddard. Connecticut Agricultural Experiment Station (New Haven) Bulletin 506, May, 1947. 19 pages.

A bulletin on the symptoms, transmission and control of the "X" disease of peach. It includes progress with internal chemical treatment of diseased peach buds and trees.

SAVE YOUR PLANE TREES, by Katherine Heinold. In *American Forests,* Dec., 1946. 3 pages.

Canker stain has taken a high toll of London plane trees throughout the East. Sanitation measures, essential to control, are given in detail.

Pest Plants

GIVE THANKS FOR WEEDS, by Robert Sparks Walker. In *Flower and Feather,* Jan., 1947. 2 pages.

An article in defense of weeds since they cover bare areas and many are favorite foods for animals and birds.

Hormones and Weed Killers

HORMONES AND HORTICULTURE, by George S. Avery, Jr. and E. B. Johnson, with B. F. Thomson and R. M. Addoms. Published by McGraw-Hill Book Co., Inc., 1947. 326 pages. $4.50.

Use of synthetic hormones in the control of plant growth. Chapters on rooting cuttings; thinning blossoms; new varieties; seedless fruit; seed treatment; and control of weeds, flowering, preharvest drop, and dormancy. How to do it and when, and what hormones to use. Illustrations and references to literature.

GROWTH REGULATORS, by John W. Mitchell and Paul C. Marth. Published by the University of Chicago Press, Chicago, Ill., 1947. 129 pages. $2.50.

Use of synthetic hormones in growth control. Chapters on weeds; propagation; dormancy; setting, dropping, and ripening of fruits; etc. How to do it. Illustrations.

2,4-D AS A WEED KILLER, by W. A. Harvey and W. W. Robbins. University of California (Berkeley) Extension Circular 133 (Rev.), June, 1947. 12 pages.

Recent recommendations concerning the use of 2,4-D as a weed killer. Includes descriptions of various commercial preparations and gives susceptibility of common weeds and crop plants of California.

EFFECTS of 2,4-D ON WOODY PLANTS IN CONNECTICUT, by Frank E. Egler. In *Journal of Forestry,* June, 1947. 4 pages.

The results of experiments at Aton Forest. Trees and shrubs injured or killed with applications of the weed-killer are listed and recommendations made for their eradication on meadow, pasture and reforestation area.

GENERAL-CONTACT WEED KILLERS, by A. S. Crafts. University of California (Berkeley) Extension Circular 137, July, 1947. 16 pages.

A circular on the advantages, disadvantages and use of the various water-soluble materials, emulsions and oils used in the destruction of vegetation.

Plant Breeding

HOW NEW PLANTS ARE MADE, by Karl Sax. In *Horticulture,* March 1, 1947. 1 page.

An article describing some of the technical phases of plant breeding.

CHRYSANTHEMUM BREEDING, by S. L. Emsweller. In *Eastern States Chrysanthemum Society Bulletin,* fourth quarter 1946; continued in *National Chrysanthemum Society Bulletin* (new name of the Society), first quarter 1947. 11 pages.

A review of chrysanthemum breeding and the techniques involved; with the results of the work at the U. S. Department of Agriculture.

Trees, Shrubs, Vines

HANDBOOK OF THE TREES OF THE NORTHERN STATES AND CANADA, EAST OF THE ROCKY MOUNTAINS, by R. B. Hough. Published by the Macmillan Co., N. Y., 1947. 470 pages. $5.50.

A reprint of the 1907 edition, it still is one of the most satisfactory tree books for the area. There is a plate of each species showing leaves, fruit, twigs and photograph of the bark, with a map of the region to which it is native.

THE IDENTIFICATION OF CONIFERS, by A. Bruce Jackson. Published by Edward Arnold and Co., London, England, 1946. 159 pages, $1.98.

This is a pocket-size book planned to help identify conifers. The illustrations aid in knowing them by the leaves and fruit.

MODERN ROSES III, by J. Horace McFarland. Published by the J. Horace McFarland Co., Harrisburg, Pa., 1947. 286 pages. $5.75.

For the rosarian this book provides information required for the ordering of plants and is a guidebook giving genealogy and description of 5,284 roses.

CAMELLIAS IN AMERICA, by H. Harold Hume. Published by J. Horace McFarland Co., Harrisburg, Pa., 1946. 350 pages. $25.50.

This is an excellent, well illustrated work. It includes the history of camellias with chapters on flower structure, bud formation, growth periods, culture, breeding, greenhouse culture, insects and diseases. A list of varieties with descriptions is included.

CAMELLIA GROWING, by R. J. Wilmot. University of Florida (Gainesville) Agricultural Extension Service Bulletin 130, Nov., 1946. 19 pages.

A short history and classification, along with the essentials of growing these plants which are hardy as garden shrubs in the lower Atlantic, Gulf, and Pacific coastal areas.

ORNAMENTAL TREES, by Harold Mowry. University of Florida (Gainesville) Agricultural Extension Service Bulletin 95 (Rev.), July, 1946. 126 pages.

A well illustrated bulletin of the trees that grow in Florida. Nontechnical descriptions and listed uses serve as an aid in identification and choice of varieties suitable for different parts of the state.

WHAT WOODY PLANTS WERE USED IN AMERICAN COLONIAL GARDENS? by E. L. Kammerer. In *Morton Arboretum Bulletin of Popular* Information, Feb., 1947. 6 pages.

Lists of ornamental plants mentioned in old garden literature, nursery lists, diaries and letters, which were grown in gardens before 1700 and newer introductions in periods since then.

MOVE IT WITH A BALL, by Montague Free. In *The Home Garden,* Aug. 1947. 7 pages.

Instructions with pictures, on balling and burlapping plants.

THE BEST IN CLIPPED HEDGES, by E. L. Kammerer. In *Morton Arboretum Bulletin of Popular Information,* Sept.–Oct., 1947. 8 pages.

Description and suggestions of plants suitable for hedge purposes based on the hedge garden at the Morton Arboretum.

CAN WE REPLACE THE ELMS? by R. Morgan Smith. In *American Nurseryman,* May 1, 1947. 2 pages.

Since elms are not resistant to disease, plant some of the smaller and fastigiate trees.

FINDING YOUR WAY AMONG THE MAGNOLIAS, by Montague Free. In *The Home Garden,* June, 1947. 8 pages.

Descriptions, cultural suggestions, and landscape uses.

BROAD-LEAVED EVERGREENS, by Donald Wyman. In *Horticulture,* March 1, 1947. 1 page.

An article which describes some of the choice broad-leaved evergreens which remain attractive throughout the winter.

GOOD VINES FOR THE SOUTH, by R. O. Monosmith. In *The Home Garden,* Feb., 1947. 5 pages.

A selection of climbers suitable for southern United States, and how to use them.

EVERGREEN HOLLIES NATIVE IN THE UNITED STATES, by H. Harold Hume. In *The National Horticultural Magazine,* July, 1947. 37 pages.

Descriptions of species and varieties, with information on propagation, planting and care.

CONIFEROUS EVERGREENS FOR NORTHERN PARKS, by Marshall G. Simonds. In *Parks and Recreation,* March, 1947. 4 pages.

A selection based on experience in Wisconsin.

Annuals, Perennials, Bulbs

HERBACEOUS PERENNIALS FOR CANADIAN GARDENS, by Isabella Preston. Dominion of Canada—Department of Agriculture (Ottawa), Publication 784, Farmer's Bulletin 138, Dec., 1946. 91 pages.

A bulletin on the planning, planting and care of the perennial border. Special emphasis on species and varieties, including lists of perennials recommended for various sections of Canada.

DAHLIAS, WHAT IS KNOWN ABOUT THEM, by Morgan T. Riley. Published by Orange Judd Co., Inc., N. Y., 1947. 224 pages. $2.50.

The book gives the history of dahlias and discusses methods of growing them. It is a competent introduction for the beginner and a good reference book for the expert.

FOR DAYLILY FANS, the Yearbook of the Midwest Hemerocallis Society. Published at Shenandoah, Iowa, 1947. $3.

The first yearbook of this new Society. It contains reports and information on growing from widely different localities.

IN AN HERB GARDEN, by Annie Burnham Carter. Published by the Rutgers University Press, New Brunswick, N. J., 1947. 209 pages. $2.

In this book the author has successfully combined her writing with her enthusiasm for gardening. Many interesting old recipes, remedies and customs add to the charm of this authoritative work.

A STUDY OF THE GENUS PAEONIA, by F. C. Stern. Published by The Royal Horticultural Society, London, England, 1946. 156 pages. $15.

An excellent treatise on the species of *Paeonia.* It includes chapters on classification, distribution, history and species grown in cultivation.

GROWING THE GLADIOLUS, by L. C. Grove. Iowa State College (Ames) Agricultural Experiment Station Bulletin P 85, July, 1947. 20 pages.

Instructions for the commercial grower and the amateur in propagation, culture and handling of corms of gladiolus.

TUBEROUS BEGONIAS, by F. F. Rockwell. In *The Home Garden,* Feb., 1947. 12 pages.

The propagation, culture and use of these striking flowers.

LILIES FOR EVERY GARDEN, by Isabella Preston. Published by Orange Judd Co., Inc., N. Y., 1947. 160 pages. $2.

This book contains all the latest cultural directions and new hybridization methods, as well as the names and descriptions of new varieties and hybrids.

GARDEN AND GREENHOUSE CHRYSANTHEMUMS, by Alex Laurie and D. C. Kiplinger. Published by A. T. De La Mare Co., Inc., N. Y., 1946. 123 pages. $2.

This revision has brought up to date the information on chrysanthemum culture outdoors and under glass. It includes the newer ideas on temperatures, soil sterilization, disease-free cuttings, and pinching, and a list of the newer varieties.

GROWING HARDY CHRYSANTHEMUMS, by A. G. Smith, Jr., Virginia Polytechnic Institute (Blacksburg) Extension Circular 410, March, 1947. 8 pages.

The essentials of growing quality outdoor chrysanthemums.

TOMORROW'S GARDEN CHRYSANTHEMUMS, by Vincent De Petris. In *Horticulture,* Sept. 15, 1947. 3 pages.

An article on the future development of garden chrysanthemums and the breeder's efforts to produce better varieties.

BULBS FOR BEAUTY, by Charles H. Mueller. Published by M. Barrows & Co., N. Y., 1947. 296 pages. $3.50.

This book tells the fundamentals of spring bulb culture. It is valuable to home gardeners, and beginners in the commercial field, for the culture and uses of the different genera.

HARDY BULBS, by Cecil Solly. Published by the Puget Sound Seed Co., Inc., La Conner, Wash., 1947. $2, paper covers.

Planting instructions and care of bulbs, with spring-flowering ones stressed.

SOUTHERN UNITED STATES IRISES—SPECIES AND HYBRIDS, by George M. Reed. In *American Iris Society Bulletin,* July, 1947. 30 pages.

A study of this complicated problem, from the standpoints of hybridization and ecological requirements.

ORIENTAL POPPIES, by A. E. Curtis. In *Flower Grower,* July, 1947. 3 pages.

Descriptions and classification.

House Plants

BEGONIAS FOR AMERICAN HOMES AND GARDENS, by Helen K. Krauss. Published by Macmillan Co., N. Y., 1947. $4.

A comprehensive and authoritative illustrated book on the history, culture and varieties of begonias with chapters on soils, potting, hybridizing, and pest control.

GROWING BEGONIAS IN AN APARTMENT, by Louis J. Kuester. In *The Begonian,* April, 1947. 3 pages.

How begonias are being grown successfully in a city apartment.

HOUSE PLANTS, by E. R. Honeywell. Purdue University (Lafayette, Indiana) Extension Bulletin 206 (2nd Rep. Rev.), 1947. 24 pages.

The essentials of growing and reproducing all types of house plants.

Lawns and Ground Covers

WHAT'S WRONG WITH YOUR LAWN? by Charles B. Mills. In *Flower Grower*, March, 1947. 4 pages.

Instructions for the making and maintaining of a lawn, or the repairing of an old one.

NO MOWING HERE, by Victor H. Ries. In *Better Homes and Gardens*, April, 1947. 3 pages.

Suggestions on the selection and use of low plants as ground covers.

THE LAWN—ITS MAKING AND MAINTENANCE. Purdue University (Lafayette, Indiana) Extension Bulletin 254 (2nd Rev.). 16 pages.

A bulletin on the making, renovating and maintenance of lawns.

MANILA GRASS FOR LAWNS, by Norman F. Childers and David G. White. United States Department of Agriculture (Washington, D. C.), Puerto Rico Experiment Station Circular 26, March, 1947. 16 pages.

About *Zoysia Matrella*, the ideal lawn grass for the lower South and successfully grown as far north as Connecticut.

Fruits and Nuts

FIFTY TROPICAL FRUITS OF NASSAU, by Kendal and Julia Morton. Published by Text House, Coral Gables, Fla., 1946. 118 pages. $3.50.

A welcome addition to any collection of books on edible fruits. Information is accurate and inclusive, giving the place of origin and description. The illustrations are excellent.

RASPBERRY GROWING, by G. L. Slate, A. J. Braun and F. G. Mundinger. Cornell University (Ithaca, N. Y.) Extension Bulletin 719, May, 1947. 67 pages.

A bulletin covering all phases of raspberry growing. Extensive information on varieties and the control of diseases and insects.

THE 1946 STATUS OF CHINESE CHESTNUT GROWING IN THE EASTERN UNITED STATES, by Clarence A. Reed. In *The National Horticultural Magazine*, April, 1947. 11 pages.

The Chinese chestnut and its varieties are described; and cultural information is given, including harvesting, curing, storing and diseases.

Conservation

CONSERVE OUR SOIL, FOREST AND WILD LIFE. Cornell University (Ithaca, N. Y.) 4-H Club Bulletin 77, Dec., 1946. 51 pages.

A well illustrated bulletin on the conservation of soil, plants, and animals. Whys and hows are explained.

LET'S SAVE OUR SOIL, by J. B. Peterson. Iowa State College (Ames) Agricultural Experiment Station Bulletin, Iowa Youth Series 1, Aug., 1947. 23 pages.

An educational bulletin prepared for Iowa youth on soil make-up, improvement and conservation.

Native Plants

ILLUSTRATED ENCYCLOPEDIA OF AMERICAN WILD FLOWERS, by Ethel Hinckley Hausman. Published by Garden City Publishing Co., Garden City, N. Y., 1947. 534 pages. $2.50.

A guidebook which combines the features of a field manual and an encyclopedia. It is arranged so that the flowers may be identified by common names or by the illustrated guide to the families.

BEFORE YOU TRANSPLANT WILDFLOWERS, by Walter E. Thwing. In *The Home Garden,* Oct., 1947. 8 pages.

Pictures with instructions to show the importance of knowing the root system of wild flowers before transplanting.

THE NORTHERN TRILLIUMS, by Fred M. Abbey. In *Flower Grower,* April, 1947. 6 pages.

Information on the trilliums found in New England and suggestions for their culture under garden conditions.

Greenhouses

INDOOR STORAGE PIT FOR PLANTS, by Helen M. Fox. In *The National Horticultural Magazine,* April, 1947. 2 pages.

A simple method of over-wintering half-hardy plants described in detail.

GREENHOUSE PEST CONTROL IS EASY, by Ernest D. Chabot. In *Flower Grower,* Jan., 1947. 3 pages.

An article describing what fumigants to select and how to use them for the control of insects in home greenhouses.

Flower Arrangement

THE COMPLETE BOOK OF FLOWER ARRANGEMENT, by F. F. Rockwell and E. C. Grayson. Published by the American Garden Guild, Inc., N. Y., 1947. 320 pages. $4.95.

A comprehensive treatment of theory and practice of flower arrangements for the home as well as for exhibitions. The book is illustrated with color reproductions, line drawings and black and white photographs.

FLOWER ARRANGEMENT FOR EVERYONE, by Dorothy Biddle and Dorothea Blom. Published by M. Barrows & Co., Inc., N. Y., 1947. 192 pages. $2.50.

The book is for both the beginner and the advanced flower arranger.

HOW TO MAKE CUT FLOWERS LAST LONGER, by Fae Rowley. In *Better Homes and Gardens,* June, 1947. 1 page.

A list of do's and don't's on the proper care of cut flowers.

MAKE YOUR OWN MERRY CHRISTMAS, by Anne Wertsner. Published by M. Barrows & Co., N. Y., 1946. 112 pages. $2.

This book gives many ideas for decorating the home and tells how to fashion wreaths and garlands with materials at hand. There are many suggestions for unique table decorations during the holiday season.

FLOWER ARRANGING FOR THE AMERICAN HOME, by Gladys Taber and Ruth Kistner. Published by Macrae-Smith Co., Philadelphia, Pa., 1947. 221 pages. $2.75.

A discussion of design, color and form for the simple or the most elaborate arrangement.

WITHIN
THE BROOKLYN BOTANIC GARDEN

COME TO THE GARDEN AND LEARN!

Above-the-quota enrollments were received in each section (morning and evening) of courses in landscape gardening and flower arrangement offered to the public this past autumn.

"Flower Arrangement for Beginners" was taught by Mrs. George Fedderson, a member of the Garden's Auxiliary and Secretary of the New York Federation of Garden Clubs. Members of the staff and guest speakers assisted her.

The course consisted of demonstrations, practice assignments and critiques. Flowers, evergreens, autumn leaves and other material were supplied by the Garden. The students brought containers from home and learned new ways of using their own equipment.

Because of many requests of those participating in the course and others who were unable to register, this course will be repeated during the winter.

Miss Alice Recknagel, Landscape Architect, collaborated with members of the staff in "Landscape Gardening for Amateurs." Actual work in the greenhouses, and demonstrations in the potting room and on the grounds supplemented the lectures on design and on selection of plant materials. Most of the sixty students took advantage of the opportunities for individual conferences and consultation about their own gardens. A similar course to guide the spring gardener will be offered in April and May.

Two courses conducted especially for teachers (Gardening and Horticulture, and Nature Science) are still in session and are both over-subscribed. Each course lasts for fifteen weeks; students who attain satisfactory grades are granted credit by the Board of Education of the City of New York. Practical work outdoors and in the greenhouses is stressed in each course, and plants raised become the property of the students.

Miss Frances Miner and Miss Eleanora Smith conduct the Gardening and Horticulture course. Subjects covered include plant propagation, soils and fertilizers, care of indoor plants and plans for a small flower garden.

Mr. Marvin M. Brooks of the Board of Education assists Miss Miner and Miss Michalena L. Carroll in conducting the Nature Science course. Lectures, demonstrations and field work are used to acquaint students with material in the Garden and to illustrate correlated activities and science lectures in the classroom.

DISPLAY OF FLOWER PAINTINGS

On view in November were a hundred orchid portraits, Conte crayon illustrations of rare flowers, and paintings of American wild flowers in their natural habitats—the work of Miss Tabea Hofmann, well-known New York artist.

The exhibition was formally opened to 150 guests at a private showing on November 12, when a reception was given in Miss Hofmann's honor.

At a talk in the exhibition room the artist explained the techniques used to obtain accuracy of form and color, and described some of her experiences during work on her various collections. Many of the paintings singled out for comment have appeared in the 15 books Miss Hofmann has illustrated. A childhood garden was the inspiration for a series of pictures which illustrates her article, "Daisy Hill," published in the November issue of House & Garden magazine.

Following the exhibit and talk, members of the Garden viewed the magnificent chrysanthemum display in the greenhouses, and the Garden Auxiliary served tea in the rotunda of the Laboratory Building.

FALL ROSE DAY

More than 300 persons, representing several states—from Virginia to Connecticut—attended the twentieth annual Fall Rose Day held October 7, 1947 at the Botanic Garden. The program was sponsored jointly with the American Rose Society.

Speakers included Dr. Raymond C. Allen of Harrisburg, Pa., Executive Secretary of the American Rose Society; Harry L. Erdman, Manager of the Hershey Rose Garden at Hershey, Pa., and Eugene S. Boerner, Director of Research for the Jackson & Perkins Co. of Newark, New York.

After their scheduled addresses, the speakers participated in an open forum on rose problems. Dr. Conrad B. Link, Horticulturist of the Garden, was moderator. Questions from the audience kept the rose experts busy long after the scheduled time for the indoor program to end.

A tour of the Rose Garden was conducted by members of the Garden staff.

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